

The Mining Journal

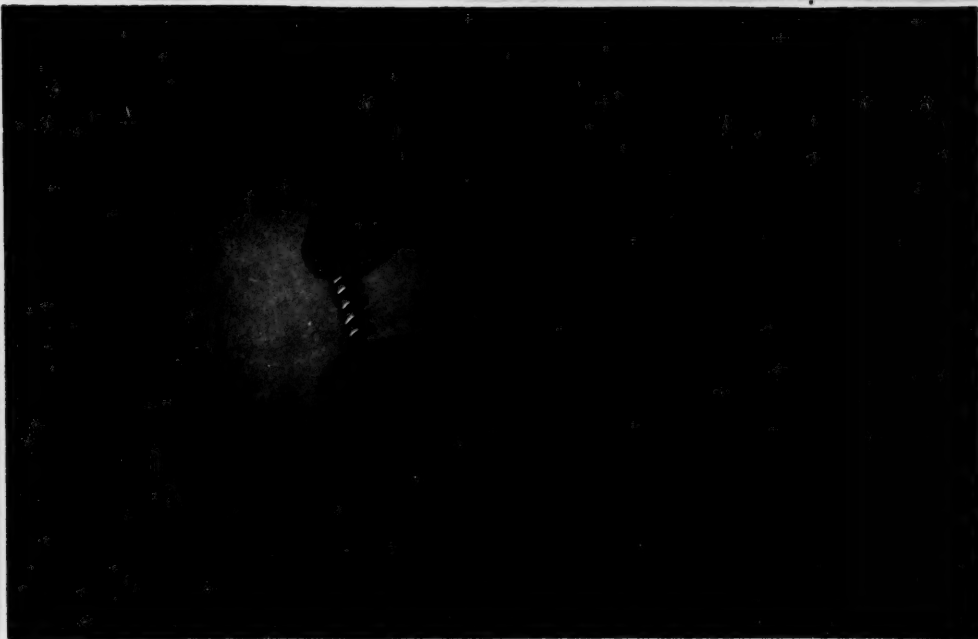
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Railway & Commercial Gazette

Vol. CCXXXIX No. 6100

LONDON, SEPTEMBER 19, 1962

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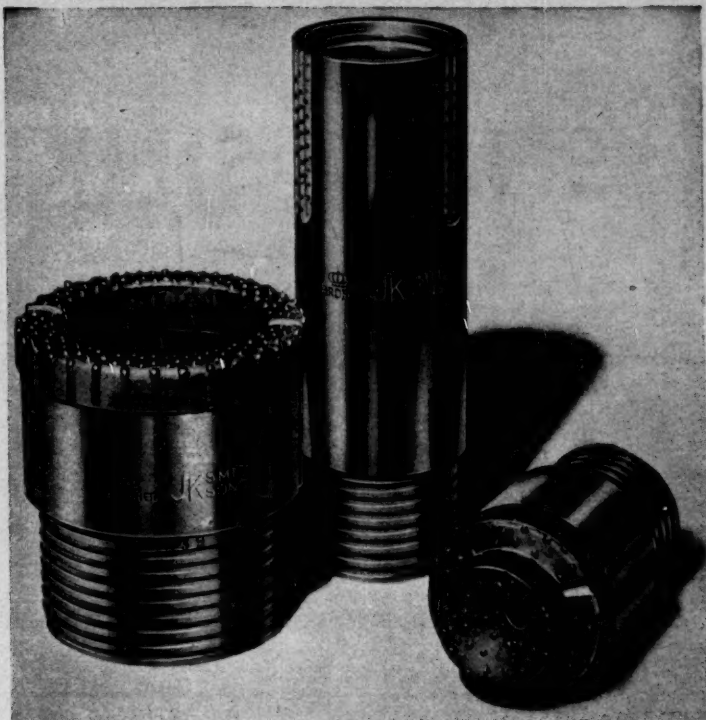
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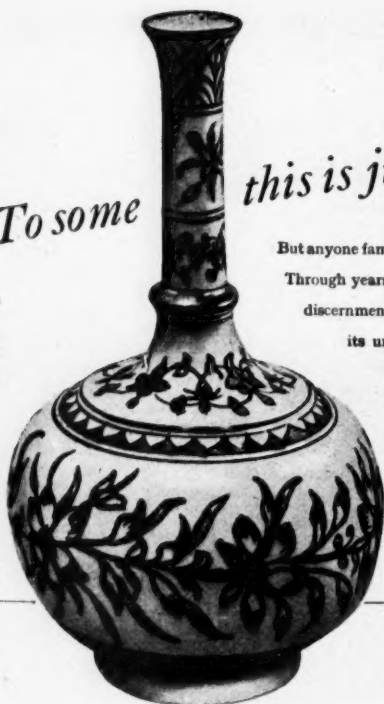
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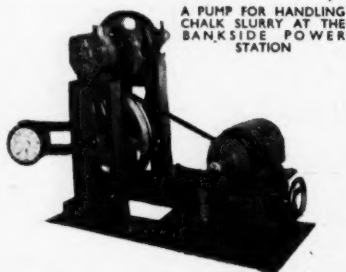
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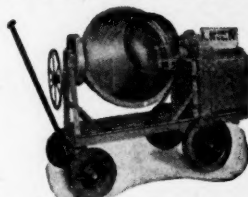
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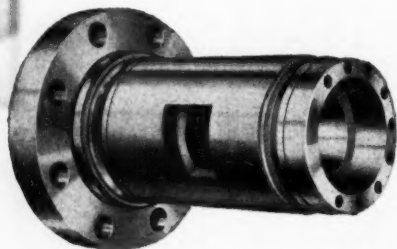
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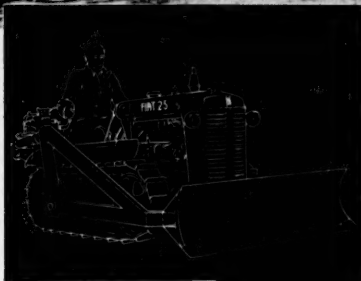
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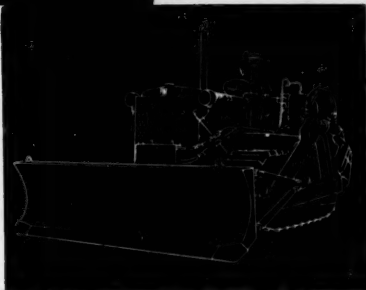


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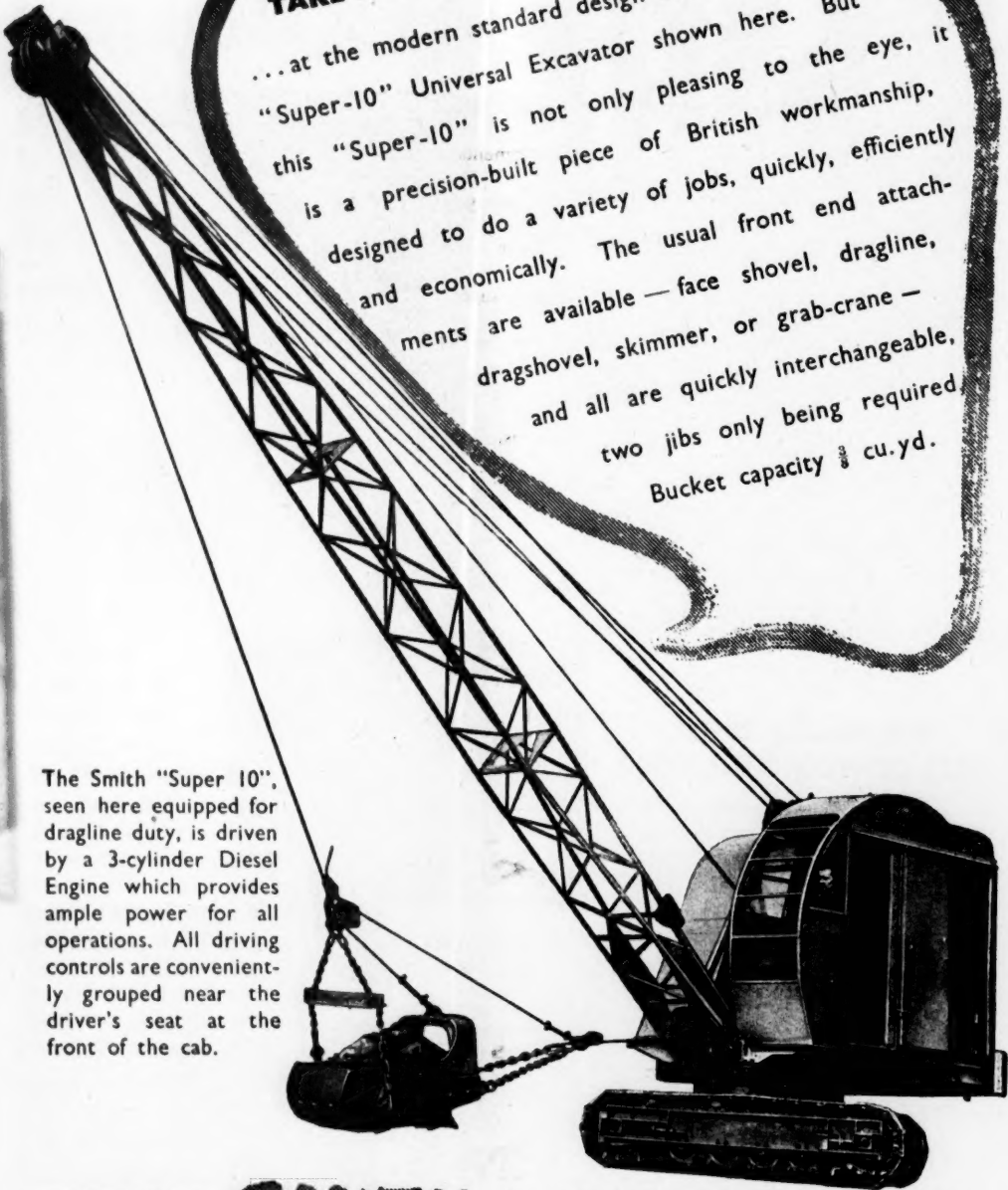
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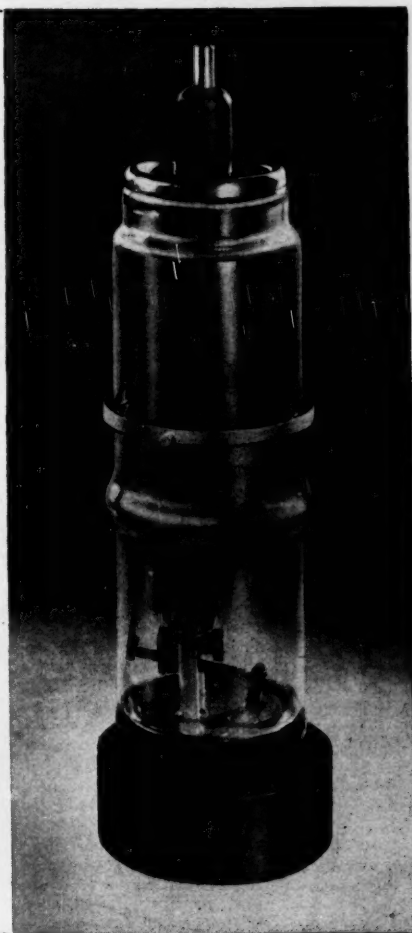
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The Mining Journal

Established 1835

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NOTES AND COMMENTS

Gold—the Policeman of the Politician

While, so far, we have only got fragmentary accounts of the proceedings of the I.M.F. meeting at Mexico City, these suggest that a closer approach is being made to the fundamental issue of gold currencies v. managed currencies. Mr. Havenga is reported as saying: "in the modern welfare state economic factors have been subordinated to the over-riding social objective of full employment. Effective prosecution of this objective requires a flexible monetary standard." Everywhere, to-day, citizens are asking what is the real value of their currency—pound, franc, lire, florin, peseta, escudo or what you will? Even in the U.S. critics of the rigid \$35 per f.o.z. price are talking of "our 50c. dollar."

All this means that the world has no fully accepted measure of the real value of anything. The Gold Standard aided by Bills of Exchange worked with increasing smoothness and acceptance for a century throughout the commercial world, till the first world war imposed upon it an intolerable strain, since when we have experienced exchange instabilities, currency and loan repudiation and concertinering, and multifold uncertainties which earlier economists assumed had been banished for ever.

The strains and stresses, crippling before, became intolerable after World War II and have resulted in uncontrollable inflation, currency devaluation and inconvertibility, tariff walls, import restrictions, and an ever-growing crop of barriers to international trade, population, migration and the free play of economic forces.

Currency devaluation means increase in purchase prices and cost of living and is the basis for the higher wage claims which so seriously threaten the economic balance of this country at the present time. The grandiose Beveridge programme to "abolish want" threatens the economic structure upon which the conceptions of the Welfare State rests, and if logically applied, must lead towards Mussolini's dictum "all equal and all poor." This may seem a "hard saying; who can bear it?", but all the monetary and financial convulsions and expedients of the last 20 years or so have done nothing to restore order to a disordered economy.

We have often pointed out that all the effects of any arbitrary interference with the normal supply and functioning of the world's gold can only become evident in the

course of years and any sudden reversion to an international gold standard would seem impossible immediately but it is a goal always to be kept prominently in view remembering the famous Virgilian warning: *Facilis descensus Averni: sed revocari gradum hic labor, hoc opus est.*

Aluminium's Expanding Horizon

To comment on the Paley Report in regard to aluminium, which is reviewed elsewhere in this issue, is much more difficult than in the case of the industrial metals with which we have long been familiar. Technological developments are still in many directions largely in the experimental stage; they are being developed by a few big concerns only, and the competitive factor with other materials must depend on the course of base metal prices which cannot be estimated to-day. Consequently, we must largely accept the views of the Paley Report writers and apply their data to a field which otherwise is but scantily beacons. The Report certainly brings out a prospect of expansion and substitution which is unparalleled elsewhere among industrial metals. Moreover, a hint of how the future is regarded in copper circles seems implicit in the decision of the great Anaconda Copper Co. to enter the aluminium field.

The small number of big producers, which at the moment number four, Alcan (Canadian) and Alcoa, Reynolds, Kaiser, and eventually Anaconda (U.S.A.), together with the great financial strength and technical experience requisite, naturally favours the existence of an aluminium cartel and this possibility has long attracted the close attention of the U.S. Department of Justice, which some years ago took steps to sever interlocking arrangements between Alcoa and Alcan. The U.S. producers—later arrivals on the scene—seeking to exclude competition from extra U.S. concerns, support the present tariff on imports of raw aluminium of 1½c. per lb. and 3c. on fabricated metal, but the authors of the Report recommend strongly its abrogation together with the duty on imported bauxite of 50c. per ton and the issue may well depend on the result of the Presidential Election.

In the discussions on stockpiling, aluminium and bauxite figure prominently—alumina cannot be stockpiled. Hitherto

the Munitions Board have concentrated on stockpiling bauxite but the Report makes a strong case for concentrating more on the metal. The general conclusions repeat those expressed in Mr. Samuel W. Anderson's report to the D.P.A., reproduced in *The Mining Journal* of June 13 and July 4 last.

Aluminium in Brazil

In a recent issue of *The Mining Journal* our correspondent from Brazil briefly mentioned a project planned to make that country self-sufficient in the production of aluminium by 1954. Further information now to hand presents a more detailed picture of the development, embarked upon by the Companhia Brasileira de Alumino (C.B.A.) which is building a plant at the company town of Alumino, near Sorocaba, 75 kilometres from Sao Paulo. This plant is nearing completion and is expected to be producing 5,000 tons of aluminium annually by the beginning of next year.

The production programme planned is then intended to amount to 10,000 tons per year by the beginning of 1954, 15,000 tons by 1957, 20,000 tons by 1960 and 25,000 tons by 1962. It is hoped that the ultimate goal of 50,000 tons per annum will be reached by 1965, and that domestic consumption of 12,000 tons will be met by 1954 through the joint activities of C.B.A. and the Canadian-controlled Cia. Electro Quimica Brasileira at Ouro Preto in Minas Geraes.

During the first stage of the development programme, equipment within the plant will include an aluminium oxide production unit with an output of 80 tons per day and a metallurgical plant with an output of 30 tons per day. Additional installations will include an electrode manufacturing unit, a foundry with a capacity of two or three tons a day of sand box castings and two tons a day of pressure castings, as well as a tube and profile extrusion mill and a rolling mill with a combined capacity of 10,000 tons per annum. Other equipment include an aluminium paper mill, a wire drawing and electric cable plant, and production equipment for sulphuric acid and ammonium sulphate.

Future stages of the project envisage specific units for the manufacture of synthetic cryolite, aluminium powder and vanadium oxide. The first 35,000,000 cr. of the budgeted 40,000,000 cr. allotted for the first stage of the development has already been spent. The ultimate cost is to be kept within the budget of 1,000,000,000 cr. to cover the installations at Alumino.

The integrated project includes its own hydro-electric station with an initial power of 50,000 kW, eventually to be increased to 180,000 kW, work on which began in March this year. The mining of bauxite at Pocas de Caldas, 360 kilometres distant, is also envisaged in the project.

International Machine Tool Exhibition 1952

The International Machine Tool Exhibition 1952 organized by the Machine Tool Trade Association opened at Olympia, London, on September 17, and will come to a close on October 4.

Bigger and more representative than ever before, there are between 1,300 and 1,400 major machine tools on view, and a little less than half of these are of foreign origin, but are being exhibited by British agents.

Although the overall conclusion emerging from the Exhibition is that U.K. machine tool manufacturers are being strongly challenged, particularly from the revived German industry, the British machine tools displayed provide ample confidence that this challenge is being effectively met, and the examples shown reveal that British workmanship has lost none of its traditional qualities of accuracy and precision.

Australia

(From Our Own Correspondent)

Melbourne, September 1

It seems that Mount Morgan, the great Queensland gold-copper mine will expand its activities in the near future. The past two years has seen additions to, and improvements in, the mining plant in use in the open cut, mainly in the capacities and design of mechanical shovels, use of percussion and wagon drills, and in motor transport for removal of overburden from the shovels to the dump. Ore is sent down the open cut to an underground crushing station, and raised through an incline shaft to the mill. Ore reserves have been greatly increased by exploratory work in the Sugarloaf section of the mine; the ore occurrence here has been known for many years, but it is only since the great advance in the development and efficiency of the open cut operations, helped by the improved price for copper, that this large deposit has become a valuable asset, by which ore reserves have been increased to some 15,000,000 tons of open cut ore.

The pyrite concentrate by-product from the concentrating mill is becoming of growing importance as a source of sulphur to acid manufacturers, and its seems very probable that the company's research into the recovery of elemental sulphur from the sulphide ores will become commercially practicable.

MOUNT ISA'S NEW MILL AND SMELTER

The chairman of directors of Mount Isa Mines Ltd., Queensland, has stated that the new copper concentrating mill and smelter will be in operation early next year, and that initial production will be 15,000 tons of copper per year, increasing to 18,000 tons. All copper produced will be sold in Australia to help in meeting the acute shortage of the metal, which has to be met from imports. With this increase in Australian production, it will still be necessary for the country to import about 8,000 tons of copper per year. The company has recently taken up a colliery at Collinsville, on the Bowen, Queensland, coalfield, and is now diamond drilling the area.

WOLFRAM AND LEAD MINING IN TASMANIA

Wolfram has attracted renewed attention in Tasmania where Aberfoyle Tin and King Island Scheelite are earning big revenue at the present prices for tin and tungsten. One of the largest tin-wolfram occurrences in Tasmania, Storey's Creek, is being worked on a very inadequate scale, despite the size and value of the lode, which is of commercial value for a length of some 3,000 ft. Recently, a mine of one-time importance, the old Shepherd and Murphy, at Moira, on the north coast, was examined and rejected, possibly more on account of purchase terms than the mineral prospects. A recent report states that attention is to be given to scheelite and wolfram at Interview River, near Pieman Heads, on the west coast. There is the usual published forecast of a "rich field." Wolfram at Interview River, alongside the old Zeehan coastal track, has been known for many years, but does not seem to have been other than a wages proposition to prospectors.

A new lead mine is now in production. This is Montana Silver Lead N.L., at the northern end of the Zeehan field, and about two miles from the workings of the old mine of the same name, which was a well-known producer in the active days of the field. Initial opening up was done just before the war, but during the war years the mine was idle, and was re-equipped with mining plant, and operations resumed some three years ago. Two levels have been opened up and a gravity concentrating plant built; this will be supplemented later by a flotation unit.

Canada

(From Our Own Correspondent)

Sudbury, September 5

The output of gold continues to decline in Canada. While this is a serious matter for individual mines and for the tens of thousands of people who have invested in the industry, it is also an open challenge to the government of this country.

GOLD MINING INDUSTRY NEGLECTED IN BOOM ECONOMY

At the moment, Canada is prosperous because of defence spending, oil and iron development, high wages, and record employment. Many industries are expanding and new developments are taking place as in the case of aluminium—and also new railway construction, oil and gas lines. All this has added up to a high fever at the seat of government. With temperature running high there is a tendency to forget that it will subside some day—and with that will come the period of cold reaction. And there are some careful observers who believe the hour of reaction will reveal to the people of this country that in the current period of abnormal conditions the government neglected the welfare of the gold mining industry.

The Truman Administration at Washington appears to be determined to cling to \$35 gold right to the bitter end. John Snyder, Secretary of the U.S. Treasury, has announced this week that nothing will be done to change the price of gold—neither will private individuals be permitted to buy coined gold. Douglas Abbott, Minister of Finance at Ottawa, voices sympathy for the gold mining industry of Canada but his actions suggest that this support is confined to lip service only and nothing more—subservience to the will of Washington. As a result, interest in gold mining in this new country continues to wane, despite the part which the gold prospector played in the past progress of the vast undeveloped areas of the nation, and could still play in the yawning and uncertain years ahead. Gold being what it is, and with the desire of man to possess the metal being as old as the ages, the multitude who follows the fortunes of the industry never seems to waver in the thought that some day—somehow—an ounce of gold will take on sufficient value to buy 35 bushels of wheat as it did in years gone by.

DEMAND FOR NICKEL CONTINUES STRONG

The demand for nickel in construction of jet engines and the general demand for stockpile requirements of nickel steel, is believed to preclude any possibility of relaxation of controls on the metal for a further long period. International Nickel Co. of Canada, and Falconbridge Nickel Mines—the two big enterprises which give Canada a predominant position in the world's output of nickel, are both extending development at a record pace and are both expanding facilities for smelting and refining. In March last, Falconbridge Nickel switched its refinery over to the chloride process and although difficulties were experienced, these were less than expected. In fact, production is increasing at the refinery and its capacity is expected to reach or exceed that of the company's smelter before the year end. In the half yearly report covering operations from January to June last, it is reported that no cobalt was marketed during this period but the production of marketable cobalt was now increasing.

In addition to these two companies there is another entirely new nickel mine of importance under development in Manitoba—the Lynn Lake Mine of Sherritt-

Gordon Mines. This new nickel mine is of such importance that the Canadian Government through Canadian National Railways is building a new line to the property—and with extensive hydro-electric developments under way to provide motive power for the mine.

Another mine of considerable magnitude appears to be in the making in the Sudbury district of Northern Ontario—the new project known as Ontario Pyrites. The property embraces a particularly large area which contains extensive deposits of copper, lead and zinc. The company is controlled by Hoyle Mining Co., a subsidiary of Ventures, Ltd. The deposits were explored to considerable extent more than two decades ago, but low metal prices and complexity of ore precluded success. Now, with metal price higher and with improved metallurgical processes developed, the huge tonnage is believed to lie within the realm of economic development. A detailed programme of diamond drilling has confirmed and added to earlier estimates. The company is well financed and will begin sinking a main shaft within the next few weeks. The net value of metal content of the ore after allowing for shipping charges has been estimated at about \$12 per ton, and with operating costs slightly under \$6 per ton.

WIDESPREAD INDUSTRIAL DEVELOPMENT IN BRITISH COLUMBIA

In British Columbia, Canada's westerly province is in the throes of widespread industrial development. Outstanding projects include a new oil line across the Rocky Mountains, a \$550,000,000 aluminium enterprise, and a \$65,000,000 expansion programme by Consolidated Mining & Smelting Co. Also, there is an \$85,000,000 trans-mountain pipe line under construction from Alberta to the Pacific Coast, designed to provide cheap gas with which to heat the homes and drive the expanding industrial plants of British Columbia.

In Northern Saskatchewan the development of uranium deposits is gaining momentum. Statistics are not available, but sufficient information has already been given out authoritatively to suggest one of the major uranium-producing areas of the world is under development—spearheaded by a Canadian Government Crown Company.

For pioneers in whose veins the spirit of adventure runs strong, there is appeal in recent discoveries in Canada's farther north—where, in the barren lands west of Hudson's Bay, nickel deposits have been revealed. There the land is not only barren, but the earth remains frozen the year round to a depth of several hundreds of feet. Diamond drilling can only be undertaken by using salt or briny water which will not freeze and thereby hold the valuable diamond drills captive. Yet, despite the forbidding area, bunkhouses and cookeries in which to house and feed working crews are in course of construction at this time. It is an area in which large companies with abundant capital can alone operate—and a setting which offers rather bleak and dreary prospects for the individual prospector.

GROWING CAPITAL INVESTMENT IN CANADA

New capital investment in Canada is growing at a rate of close to \$350,000,000 per month—this rate having prevailed throughout the past year and showing signs of further increase. Security regulations in the United States which hampered American participation in the shares of new companies in Canada, are being relaxed to a limited extent, and this may point the way toward an increasing wave of American investments in this country. The efforts of the U.S. Government to keep money at home appears to be giving way to a growing belief that what is good for Canada is also good for the United States.

THE PALEY REPORT—V

Aluminium—Vast Scope for Expansion

The authors of the Paley Report endorse the general acceptance of the view that compared with the older metals, aluminium is still in its infancy and make it clear that any estimate of future consumption can only be tentative as it must pre-suppose a given degree of substitution and development of new uses which at present can only be surmised. Aluminium is already cheaper by weight, and much cheaper by volume than copper, lead or zinc, and production can be greatly increased without any serious cost increase. In the matter of substitution the report considers it unlikely that the quantity of aluminium which may be substituted for other non-ferrous metals will eventually exceed 1,000,000 tons, and believes that achievements in this direction may ultimately be dwarfed by substitutions for steel and wood, where the possibilities in the construction, transportation and machinery industries are virtually unlimited. The military uses of aluminium are clearly going to be greatly extended, not only in the aircraft industry but in all departments of army equipment to facilitate the airlifting of large military units.

CONSUMPTION

Beginning with an output of 3,000 s.tons in 1900, the United States consumption of primary metal from all sources was 903,000 s.tons in the base year 1950, and is forecast as possibly 3,600,000 s.tons by 1975, or an increase of some 400 per cent over the next 25 years. Additionally, scrap consumption which was about 63,000 s.tons in 1950 is estimated at 900,000 s.tons in 1975.

Consumption in the rest of the Free World is placed at 605,000 s.tons in 1950. While admitting the extreme uncertainty of estimating the future level of consumption outside the United States, a projection of 2,400,000 s.tons by 1975 is adopted which would imply a total world demand of 6,000,000 s.tons; thus placing aluminium even on a tonnage basis second only in magnitude to steel and on a volumetric basis the equivalent of possibly 18/20,000,000 s.tons.

PRODUCTION

Despite this increase in estimated demand which is unparalleled by any other metal, no supply difficulties in meeting it are foreseen. Free World production in 1950 is placed at 1,423,164 s.tons of primary and 203,000 s.tons of secondary metal, making a total of some 1,626,000 s.tons.

In the U.S. the only restrictive influence on increased production, apart from the supply of the raw material for alumina, is judged to be the cost of current which to-day is almost entirely hydro-electric power, but which should be supplemented in future by electricity derived from coal, lignite and natural gas. Reduction of alumina to metal requires approximately 9 kWh of electric power for every pound of metal representing between 1.7c. and 2.3c. per pound, or 10 to 13 per cent of the American market price in 1949. Increased demand for electric power by the U.S. industry should increase from 13 billion kWh to 65 billion kWh in 1975. Should hydro-electric power not be developed to the point necessary to meet the increased requirement or should its cost advance unduly, large amounts of power can be produced from steam generating plants using gas, coal or lignite.

Hydro-electric power is available in Canada at less than the average cost to U.S. aluminium producers, and so far as this handicap is concerned it is suggested that the U.S.

should encourage expansion of production outside its territories, not only in Canada but possibly in West Africa, India, Brazil and the Guianas, both to stretch United States reserves of raw material and for the sake of economy.

The principle which the report therefore suggests should govern the U.S. tariff policy is that it should be neither so high as to prevent recourse to low-cost sources outside the States, nor so low that it leads to an unbalanced dependence on foreign plants.

BAUXITE RESERVES

While the situation as regards the production of aluminium metal is reassuring, this would in itself be quite inadequate without at least a corresponding volume of primary raw materials, to-day practically wholly bauxite. However, the cost of producing aluminium is the critical factor rather than the availability of the natural resources.

The Bayer process, which is now in general use for extracting alumina from high grade bauxite, represented 30 to 40 per cent of the total for the production of the metal itself, at a time when net operating cost (excluding depreciation) was 7.7c. in Canada, and 10.5c. to 11.6c. in the U.S.A. During the second world war, the U.S. Government research specialists worked out the "Modified Bayer Process" at Hurricane Creek, Arkansas, which enabled bauxite with silica in excess of 8 per cent to become economic. This development increased the economic reserve of the U.S. from some 10,000,000 to 40,000,000 tons with corresponding additions to the Free World reserves generally. These latter are set out as follows:

Bauxite Reserves of the Free World

	Reserves (000,000 tons)	% alumina	Contained* Metal (000,000 tons)
Jamaica.....	315	50	67
India.....	250	60+	64+
Gold Coast.....	230	53	51
Brazil.....	150	61	41
Yugoslavia.....	100	60	26
British Guiana.....	65	61	17
France.....	60	61	16
Greece.....	60	57	15
French W. Africa.....	50	60	13
U.S.A.....	50	50	10
Surinam.....	50+	59	13+
Haiti and Dominican Republics.....	30	47	6
Indonesia.....	25	54	6
Australia.....	20	39	3.5
Nyasaland.....	20	42	3.6
Malaya.....	10	56	2
Italy.....	5-10	?	?
Palau Islands.....	2	51	0.5
Free World total.....	1,500		350

*Calculated on an assumed 85% recovery of alumina from bauxite and 2 tons of alumina per ton of aluminium.

What constitutes bauxite reserves is subject to some elasticity of estimation as process improvements occur. To-day, using the modified Bayer process, bauxite with a silica content of 13 per cent is almost as economic as a low silica ore (—7 per cent).

However, reserves of aluminous ore are not confined to bauxite, and the above enumeration is very far from exhausting the potentialities for aluminium production. There exist in the U.S. huge deposits of lower grade bauxitic ores and non-bauxitic materials such as clays and anorthosite

containing 30 per cent or more alumina which should be able to yield aluminium at roughly 3c. per lb. above the present total cost.

PROSPECTIVE EXTRACTION PROCESSES

Various processes exist or are being worked out to deal with non-bauxitic material more particularly the Kalunite process using alunite; the amonium-sulphate and lime-sinter processes using clay; and the lime-soda-sinter process using anorthosite. Costs of producing alumina by these methods are less than 50 per cent higher than by the Bayer process treating high grade bauxite, and further developments should bring these costs down.

It is considered that the Pederson process in commercial use in Europe might be applicable to some of the high iron

lateritic ores of the American North West. The report also mentions that it is believed that in Russia aluminium is being produced from syonite on the Kola Peninsula.

Increased economy is looked for also in the reduction of alumina by means of the Soderberg continuous electro process which may considerably reduce the amount of electric power required. There are other methods, radically different from the Hall process, one of which consists of the electrothermal production of an aluminium-silicon alloy with subsequent extraction of the metal with zinc or quick-silver, which on distillation leaves the aluminium behind. This process was developed commercially in Germany during the war. Recovery of aluminium from electrothermic alloys and scrap by the sub-hallide process is being studied by Alcoa.

Southern Rhodesia's Small Gold Producers

By A. G. THOMSON

In the past, the small mine owner has been a potent factor in the progressive development of Southern Rhodesia's mineral industry. Until comparatively recently he was responsible for some 60 per cent of the Colony's gold output and currently more than 50 per cent of Southern Rhodesian asbestos mines are small-owner properties. However, rising costs have made his position precarious, and despite the technical and financial facilities available, the author states that more assistance must be granted to the small-owner if his contribution to the Southern Rhodesian minerals industry is to be maintained.

An examination of Southern Rhodesia's dependence on gold production revealed that in 1941 the proportion of the national income provided directly and indirectly by the gold mining industry was probably rather higher than 50 per cent. It showed that the majority of the towns derived their life-blood from this industry, and that the prosperity of a number of rural areas was largely dependent on gold.

During the past ten years the economic structure of Southern Rhodesia has been profoundly altered. Rising costs, shortage of labour, and the exhaustion of easily won oxidized ore bodies have led to a persistent decline in production, which has fallen from 790,442 oz. in 1941 to 486,907 oz. last year. On the other hand, the annual value of the base mineral output rose during the same period from £2,242,703 to £8,969,878. Asbestos is rapidly becoming the premier mineral, last year's output amounting in value to £5,452,108 compared with £6,089,285 for gold. Dependence on gold has been further reduced by the expansion of agriculture and the development of secondary industries.

Despite the phenomenal expansion of base mineral production the Government is greatly concerned about the declining gold output, since it is recognized that in any future depression gold could be a stabilizing influence. Various measures have therefore been adopted to increase production, but if gold mining is to weather its present troubles ways and means must be found of keeping the struggling smallworker from going under. Smallworkers have played a leading part in the development of the gold mining industry, with which they have been conspicuously associated for half a century.

BIRTH OF THE SMALLWORKER

In 1903, the British South Africa Co.'s directors made an alteration in the terms under which mines could be worked, permitting individuals and syndicates to work with small batteries instead of going to flotation as large companies. The introduction of a royalty basis in place of the old vendor's interest proved extremely beneficial to the country. Smallworkers were able to operate reefs and deposits far too small or too low in value to interest companies. A vast quantity of ore was therefore treated

which otherwise would have been lost to the Colony. Tributes on developed properties were readily obtained, while dumps of untreated sands were available at nominal rentals. A smallworker equipped with a boiler and battery could go from property to property, taking the best and most easily worked ore and then shutting up the mine.

The spirit of the old Rhodesian prospector is well typified by many of the curious names which were given to mines in Matabeleland and Mashonaland. There was the Just-in-Time, the Do-Me-Good, the Dream (it is said that more than one Rhodesian property was discovered through a dream), the Tuff Nutt, and the Astonishing Luck. Some of the Colony's most famous mines were pioneered by smallworkers. Among the romances of Rhodesian history was the development of the Lonely Mine in the Bubi district, to the north of Bulawayo. In 1907 Messrs. Palca and Aserman were struggling to maintain the property and keep a tiny stamp battery at work. Five years later the Lonely had become one of Southern Rhodesia's leading properties, having in its ore reserves an estimated profit in sight of £500,000. It is said that the two partners learnt of the existence of this wonderful ore body from an old Matabele chief, and that the mine was started on a capital of £16.

The Cam and Motor comprises two Eiffel Flats properties which were originally in the possession of smallworkers. Towards the end of 1909, the London and Rhodesian Mining and Land Co. acquired the properties of the Good Shepherd Syndicate and the Brothers Campion. Flotation followed about a year later and by 1912 well over 1,000,000 tons of ore of a value of 52s. per ton were said to be in sight.

Large numbers of the so-called small mines of Rhodesia are to-day embraced by the larger corporations and companies, and their names have changed with the change of ownership. Though now controlled from head offices in Bulawayo, Salisbury, Johannesburg and London, such concerns will always be associated with pioneer smallworkers, many of whom succeeded where, in the first instance, large companies had failed.

To-day, nearly half the Colony's gold comes from producers with outputs of 10,000 oz. per annum and over, but in 1935 mines of this group produced only 38.1 per cent, the balance (amounting to 450,000 oz.) being con-

tributed by 1,745 smaller producers. The total number of gold mines has now fallen to 424, of which 86.56 per cent employ less than 100 Africans, 54 per cent less than 30, and 27.40 per cent less than 10.

THE SMALLHOLDER'S CONTRIBUTION TO GOLD MINING

From these figures it is evident that smallholders collectively still constitute an extremely important section of the Colony's gold mining industry, but in only ten years that number has fallen by about two-thirds. Last year 58 producers dropped out and, according to the annual report of the Chief Government Mining Engineer and Chief Inspector of Mines, it appears likely that there will be more casualties during the current year.

Reports from Government Mining Engineers in the various districts are not encouraging. In the Salisbury and Umtali districts several of the smaller mines faded out last year due to exhaustion of payable ore and increased costs of production. In the Gwelo and Fort Victoria districts the position is becoming more difficult for the smaller mines, and it is anticipated that more of these must cease production. "With Native labour still on the downward grade," writes the Assistant Government Mining Engineer, Gwanda, "a further reduction in tonnage appears inevitable. Costs continue to rise and it will be only a matter of months now until the marginal and smaller producers are forced to close down."

Summing up the position, it is stated that increasing shortages of suitable Native labour, constantly rising costs, shortages of essential stores, and the consequent reduction in development and prospecting work, are taking its toll on the industry, and unless assistance arrives before it is too late, very rapid decreases in output from 1953 onwards are predicted.

THE INTRODUCTION OF GOVERNMENT ASSISTANCE

At the end of the war a temporary increase in gold mining activity took place, but this was due chiefly to the pegging of gold claims by the Minister of Mines in connection with the settlement of ex-servicemen on dormant mines which, in the opinion of the technical staff, held out some promise of success. A development of outstanding importance which took place during 1944 was the appointment of the Frankel Commission, which reported in 1946. Among many other important recommendations the Commission urged that royalties should be abolished without delay and this was done with effect from June 1, 1946.

The following year the Government introduced the principle of a subsidy on gold payable to mines which could support their applications with detailed information. Since the smallworker could not produce the information required as a pre-requisite to obtaining a special subsidy, the Gold Subsidy Act of 1948 made provision for payment of a general subsidy of £1 7s. 6d. per f.o.z. in respect of all gold produced, special subsidies being continued in approved cases. The International Monetary Fund ruled, however, that the payment of a general subsidy of a fixed and equal amount per f.o.z. was not in order, and an alternative system was therefore introduced. All subsidy provisions were repealed on devaluation, but producers have derived some assistance from partial premium gold sales. Permission was received from the International Monetary Fund to sell 17,000 oz. of fine gold monthly on the free market, but to the end of 1951, the increase averaged about 7s. 6d. per oz. produced, representing only about 1s. 4d. per ton milled. Full premium sales were introduced in May this year, but it is feared that they will do little more than cover increased costs. Provision for depletion allowances has been proposed, but the Executive

Council of the Rhodesian Mining Federation considers that the allowance of 10 per cent announced is quite inadequate to maintain the solvency of existing tax-paying mines.

A fund exists from which loans are made to approved operators on promising mines, both for development and for the purchase of plant. In addition, plant redundant to Ex-Servicemen's Scheme is made available to the industry by means of hire charges based on depreciation factors. Smallworkers engaged in gold mining are being seriously affected by the growing pressure on labour supplies, due to the growing demand from base-mineral mining. Other mines—asbestos in particular—are able to offer better wages and superior working conditions, often with light task work and bonuses, and in some cases better compound and recreational facilities. African employees in the smaller gold mines receive the lowest pay in the mining industry—40s. 3d. per thirty-day ticket, compared with an average of 52s. 10d. for all mines—but the small gold mines has been the hardest hit by rising costs. Mines Department Bulletin No. 3 entitled "Mechanization of Small Mines" was made available last year and contains information which is serving a very useful purpose on many small mines by enabling economies in labour to be effected. On nearly all smallworker mines operating in the sulphide zone, compressed air machine drills are now used for practically all rock drilling operations.

DIFFICULTIES OF PRODUCTION

Due to exhaustion of oxidized ore bodies, an increasing proportion of mines are treating sulphide ore, much of which is refractory. In some cases concentrates need roasting, and the smaller mines send their concentrates and barrel residues to the roasting plant, which was erected by the Government at Que Que in 1938. The necessity of treating relatively large amounts of low-grade sulphide concentrates which could not be transported economically to the Que Que plant has led to the design and operation of several small-scale fine grinding and agitation plants for small mines.

Technical assistance for the industry is provided by the Departments of Mining, Engineering and Geological Survey, whose staffs of engineers, surveyors and geologists are available for consultation, sampling, surveying, ore testing, mine and plant layout, etc. The field staff of the Geological Survey are according more attention to gold than to any other mineral.

Both technically and financially the industry is being helped in many ways and this assistance must have done much to keep many mines in production, but it seems evident that further measures are urgently needed if the smallworker and all he stands for is to be preserved.

The small man's contribution to the mining industry of Southern Rhodesia is by no means confined to gold. Of the Colony's 58 asbestos mines, 23 employ less than 50 Africans and 14 less than 10. The small man is at present reaping the benefits of having ample ore at the surface, but it is considered that as his quarries are exhausted he must give way to companies which can finance the development required to mine the ore bodies in which the fibre is contained. The majority of the mines producing tungsten concentrates have less than 25 African employees, and smallworkers are also associated very prominently with the Colony's growing output of beryl, production of which comes in small quantities from widely separated areas. Royalties on most base minerals range from two to five per cent according to the mineral. On chrome and mica they are on a per ton basis, the production of chrome being now mainly in the hands of two substantial companies with ample resources.

The Institution of Mining and Metallurgy's Symposium on Mineral Dressing

A REVIEW BY Mr. F. B. MICHELL, B.Sc., A.C.S.M., M.I.M.M.

Advances in the field of mineral dressing in the post-war period have progressed along a very wide front, the discoveries yielded from fundamental research being, in general, paralleled by the introduction of new techniques and plant practices. These important advances, however, have not been the monopoly of any one country and, taken as a whole, their synthesis is a matter of urgency. Thus the Symposium on Mineral Dressing to be held next week at the Huxley Buildings of the Imperial College of Science and Technology—yet another of the conferences of this type which have been so successfully organized by the Institution of Mining and Metallurgy—will serve as a most opportune forum where the whole range of mineral dressing problems from fundamental research to plant practice can be discussed by specialists from all parts of the world. As an aid to those members of the Symposium, who may not have had time to read through all the papers in full, *The Mining Journal* invited Mr. F. B. Michell, the Vice-Principal of the Camborne School of Mines, to review the papers and to draw attention to some of the principal points therein.

At the Symposium to be held September 23 to 25 in the Imperial College, no less than 39 papers will be presented and discussed covering a very wide field from fundamental research to plant practices.

Only a limited field is presented, however, in the latter class there being nothing dealing with the general aspects of leaching techniques, of tin and tungsten recovery or of some of the important non-metallic minerals.

Session 1. 10 a.m. Tuesday, September 23.

Paper No. 4.—*Determination of the area of metal and mineral powders by four different surface techniques.* By Mr. B. D. Cuming and Dr. J. H. Schulman (Rhokana Unit of the Department of Colloid Chemistry, Cambridge University).

Paper No. 5.—*Purpose in fine sizing and comparison of methods.* By Mr. E. J. Pryor (Reader in Mineral Dressing, Royal School of Mines), Mr. H. N. Blyth (Lecturer in Mineral Dressing, Royal School of Mines), and Mr. A. Eldridge (South West Africa Co., Ltd.).

Paper No. 6.—*Fundamental principles of sub-sieve particle-size measurement.* By Dr. H. Heywood (Reader in Mechanical Engineering at the Imperial College of Science and Technology).

Paper No. 7.—*The Technique of particle size analysis in the sub-sieve range.* By Mr. G. L. Fairs (Research Department, Imperial Chemical Industries, Ltd.).

Paper No. 8.—*Release analysis, a new tool for ore dressing research.* By Mr. C. C. Dell (Senior Metallurgical Assistant, Mufulira Copper Mines, Ltd.).

The fourth paper has not been published to date.

In paper No. 5, after enumerating the purposes of sub-sieve sizing, the authors discuss sedimentation and elutriation. The Blyth elutriator, a system using a series of stirrers and tubes is described as well as the excellent method of sedimentation used at the Westport Laboratories of the Dorr Co.

The conclusions reached are that, although each method tried (i.e. Infrasizer, Blyth Elutriator and Sedimentation) was reasonably accurate, sedimentation gave the best results in the tests, but takes more time, although no elaborate apparatus is necessary.

The conclusion that sedimentation is better is also reached by Dr. Heywood in paper No. 6. From purely theoretical considerations it should be possible to obtain complete separation by elutriation but unfortunately flow in the elutriator tube is not constant.

In decantation methods, finality can only be reached after an infinite number of operations, but in practice the method is superior to elutriation. A design for a siphon is given for use in this work and the early part of the paper deals with the principles of particle motion, and various methods of size analysis.

In paper No. 7, Mr. Lowrie Fairs describes methods used by I.C.I. Ltd. over a number of years, including counts under the microscope, sedimentation and air elutriation. A very ingenious sedimentation method is described in which the whole of the settled material is removed periodically, thus giving a larger proportion for weighing than in a pipette method. An air elutriator and a simple method for specific surface measurement are also described.

It seems very likely that the choice of methods is likely to vary with the work undertaken and the results desired.

Like many other measurements of which surveying is probably the best example, methods should be chosen with an appreciation of the true values of accuracy and speed, having regard to the purpose of the measurement.

In making a comparison of methods (see paper 5) it seems a pity that the results of some simple hydraulic elutriator were not included. It may also be of interest to note that the China Clay Industry changed from elutriation to sedimentation some years ago, employing a decantation method for particles over 10 and a pipette method for finer sizes in routine work.

In paper No. 8, Mr. Dell describes a new technique consisting of splitting the sample into a tailing and a series of concentrates, so that theoretically every particle in the first concentrate is of higher grade than any particle in the second and so on. Products are weighed, assayed and results plotted and thus by comparing samples produced with different grinding conditions, etc., the state of release of the mineral from the gangue can be determined.

The technique is novel and there is room for a great deal of speculation as to its application to methods of concentration other than flotation.

Session 2. 11.35 a.m. Tuesday, September 23.

Paper No. 2.—*Mathematics of crushing and grinding.* By Mr. F. C. Bond (Engineer in Charge Technical Research, Processing Machinery Dept., Allis-Chalmers Manufacturing Company, Milwaukee).

Paper No. 3.—*A method of assessing the grinding efficiency of industrial equipment.* By Mr. W. F. Carey and Mr. C. J. Stairmand (Research Department, Imperial Chemical Industries, Ltd.).

Paper No. 9.—*Defining the scope of the open circuit rod-mill in comminution.* By Mr. J. F. Myers (formerly Superintendent of Concentration, Tennessee Copper Co.).

Paper No. 11.—*Crushing and screening in mineral dressing plants.* By Mr. G. J. Brown (Overseas Manager, The Nordberg Manufacturing Company, London).

In paper No. 2, Mr. Bond first presents his new theory of comminution, which first appeared in the May issue of *Mining Engineering*, shows how it can be used and then proceeds to deal with crushing, metal wear, dry versus wet

grinding, the volume of the grinding charge, pulp dilution, speed and size of media, mill diameter and length, ball segregation, circulating loads and a summary of how crusher and mill sizes can be calculated.

Essentials of a complicated subject are excellently presented in a concise and easily understood form whilst the author points out that wet grinding is nearly always more efficient than dry grinding, discusses ball migration and means adopted to counteract it and deals with methods of evaluating circulating loads.

The question of mill speed is still being argued and speeds ranging from 55 to 90 per cent of critical speed are employed and users are prepared to prove that each speed is best. Strangely enough, no mention is made of pebble mills which are so extensively used in South Africa.

Messrs. Carey & Stairmand in paper No. 3 describe how, in an attempt to overcome the shortcomings of both Rittinger's & Kick's theories, a new method of calculating the energy used has been devised. This consists of measuring the energy associated with free crushing in compression tests so that knowing the power input and size reduction, the efficiency of a comminution operation can be calculated.

Results given indicate efficiencies between 6 and 15 per cent in dry ball milling whilst a disintegrator test gave a figure of over 35 per cent. As in practice, wet grinding usually takes less power than dry grinding, further results should be interesting.

In paper No. 9, Mr. Jack Myers, a noted experimenter and writer on grinding problems, gives an excellent review of rod milling practice in which he expresses his views as to rod action and the scope of the work of a "crushing rod mill."

The action of the short high speed mills, used at Sullivan and Lake Shore, is compared with the "controlled" (and finer) work of lower speed mills at Hayden, where the product is finer and more even.

The writer suggests that the high lifter bars coupled with high speeds and heavy rods produces impact and "scissoring" whilst in finer grinding, rolling and sliding is the predominating factor. This seems to be a fairly well accepted explanation. Types of end liners are discussed and it is suggested that the important factor in rod mill action is the screening action of the "rod slots" or spaces between them.

The question of wear in the case of abrasive ore is not dealt with and appears to be an important point in considering rod milling for certain ores.

In paper No. 11, Mr. Brown briefly describes the various types of crusher and continues with a discussion on selection which summarizes the factors influencing choice and sets out twelve broad principles to be followed. This summary sets out the main points both accurately and concisely.

The importance of screen analysis is rightly stressed and the remainder of the paper deals with recent developments, most of which are fairly well known.

A new type of fine crusher, the "Gyradisc" is mentioned and the paper concludes with notes on screening, including the increased use of horizontal screens, the use of repulping pockets and the recent Symons "V" type screen. Recent trials of the hammer mill or impactor on harder rocks are not mentioned.

Session 3. 2 p.m. Tuesday, September 23.

Paper No. 10.—Recent developments in classification and fluidization as applications of the principles of particle dynamics. By Dr. J. V. N. Dorr and Mr. F. L. Bosqui (The Dorr Company, U.S.A.).

Paper No. 17.—A study of the motion of solid particles in a hydraulic cyclone. By Mr. D. F. Kelsall (Mineral Dressing Group, Chemical Engineering Division, Atomic Energy Research Establishment, Harwell).

Paper No. 18.—The hydrocyclone, its application and its explanation. By Mr. J. F. Fontein and Mr. C. Dijkman (Coal Preparation Division, Centraal Proefstation, Staatsmijnen in Limburg, Netherlands).

In paper No. 10, the authors deal with two of the recent developments in classification, the Dorr Hydroscllulator and the Dorrclone, as well as outlining the technique of fluo-solids for roasting and other heat treatments.

A detailed description of the hydroscllulator and results showing the improvement over rake classifiers is given (the low efficiency of rake classifiers is not generally appreciated), but the Hydraulic Cyclone only receives a comparatively brief attention. A table is given showing range of application and characteristics of various classifiers but it is a pity that fuller mention has not been made of other developments such as the Super sorter and the centriclone.

Paper No. 17 is a comprehensive study of the action of the cyclone, the work being based on observation made using a transparent perspex cyclone and employing fine aluminium particles which are observed by a microscope arranged to measure their velocities.

A mathematical analysis is given and a number of interesting conclusions reached, the observation agreeing with Dahlstrom's findings and although some details have been previously published, some new light is thrown on the action of cyclones. One source of inefficiency was found to be the short-circuit flow down the outside wall of the vortex finder and means to remove this "middling" for recirculation are suggested.

In paper No. 18 the writers deal with the use of the cyclone for classification and for concentration, both with stable and unstable media.

In the classification section, typical classification curves are shown and the merit of the unit for a pulp with a yield value is explained. This is an important feature as it makes feasible a separation of coarse particles in a clay suspension which would be impossible by gravity alone. It is pointed out that cyclones are being used by the Dutch State Mines for degritting the mud-flush in shaft sinking operations.

In concentration work, it is possible to achieve a considerably higher density of separation than the sp.gr. of the feed suspension and is of great practical importance in many cases, whilst a new type has been designed which, using a magnetite suspension of 2.0 to 2.2 gives a separating density of 2.9. This, if it has no practical demerit, offers advantages owing to its cheapness and the simplicity of the medium recovery circuit. In concluding the paper, the author discusses the mechanism of the separation.

Session 4. 3.35 p.m. Tuesday, September 23.

Paper No. 12.—Recent developments in gravity concentration. By Mr. F. B. Michell (Vice-Principal, Camborne School of Metalliferous Mining).

Paper No. 13.—Major alterations in H.M.S. practice during recent years. By Mr. K. A. Fern (Cyanamid Products Ltd.).

Paper No. 14.—Recent developments in plant design for dense medium processes. By Dr. F. J. Trotter (Director, Huntington, Heberlein & Co. Ltd., London).

In paper No. 12, the writer points out that in recent years, gravity concentration has been overshadowed by flotation, but that it seems likely that gravity methods may receive more attention in the future. The greatest single development has been the advance of dense media separation and the various types of separatory vessels designed to widen the range of size treated. Dealing with jigging and tabling, the importance of particle shape is stressed and various modified jig designs are described. The importance of classification before table treatment is discussed as well as the use of the Humphreys spiral and "slime" concentration. The paper concludes with a mention of the modern pneumatic table and notes on trends in the application of gravity methods in the dressing of various metallic and non-metallic ores.

In paper No. 13, Mr. Fern reviews some of the new designs of separating vessels, the problem of middling recovery. An interesting point is that a mixture of nickel powder and ferrosilicon has been tested in the United States, which will give a separating density of 3.7. No mention is made of the Dutch State Mine's cyclone using a dense medium.

In Dr. Trotter's paper, No. 14, reviewing the dense medium processes, feed preparation, separator design and stable and unstable medium are considered. The writer favours the stable type and the disciples of the two types of process (the H.M.S. and the H.H.) seem likely to enjoy a lengthy discussion on this matter.

Session 5. 10 a.m. Wednesday, September 24.

Paper No. 19.—*Concentrating ores by pneumatic tables* By Mr. E. A. Knapp (Messrs. Knapp & Bates, Ltd., London).

Paper No. 20.—*Concentration of eluvial or co-eluvial deposits in arid areas.* By Mr. E. A. Knapp (Messrs. Knapp & Bates, Ltd.) and Mr. C. T. Sweet.

Paper No. 31.—*Magnetic separation applied to mineral dressing.* By Mr. T. Gwyn Hawker (Research Engineer, Rapid Magnetic Machines, Ltd., Birmingham).

Paper No. 32.—*Electrostatic separation.* By Mr. S. B. Hudson (Research Officer, Commonwealth Scientific and Industrial Research Organization, Australia).

Paper No. 33.—*Photometric separation of ores in lump form.* By Mr. P. C. Newman and Mr. P. F. Whelan (Coal Preparation Research, National Coal Board).

In paper No. 19, three makes of tables are described after a brief historical sketch. A detailed discussion of the principles involved follows with notes on the feed size, range of size, particle shape and various adjustment.

The advantages of using a sintered metal deck are stated when particles as fine as 100 or 150 mesh can be treated. For in any gravity concentration close sizing is desirable if the specific gravity differential between the minerals to be separated is small. The effect of particle shape which is too frequently overlooked is very rightly stressed.

In paper No. 20, a modern development of the "Dry-Blower" as developed in Tanganyika is described. The last two papers in this session and the whole of the 7th and 8th sessions are devoted to various aspects of flotation.

In paper No. 31, Mr. Hawker is largely concerned with describing a few types of separators and there is little concerning the applications of this method.

Magnetic separators are grouped into low and high intensity machines. In the first class three types of pulley drum separators are described including the concentrated field type of drum, a recent innovation which is claimed

to be capable of handling all grades of magnetite and even some of the more susceptible ilmenites. No mention is made of guard magnets and their particular uses.

Under high intensity machines, much of the text is devoted to a description of multi-disc machines and the Rapidity type. It seems unfortunate that no mention is made of induced roll separators which, although they have certain limitations, are extensively used in many fields. Recent developments in the design of cross-belt machine are not mentioned.

Under wet separation, only the Crockett type is mentioned and the paper concludes with a description of an electronic apparatus for detecting non-magnetic metals in crusher feeds.

In paper 32, Mr. Hudson describes some research carried out by the Commonwealth Scientific and Industrial Research of Australia in connection with the toboggan type of separator and its variables. Effect of "reversibility" and rutile-zircon separations are also discussed and the principle of this simple type of machine is worth following up and comparing the results with other types.

It seems a pity that in such a comprehensive programme, only one aspect of electrostatic separation has been presented. Details of other modern developments such as the recent work by Foster Flass and data concerning commercial plant—which is somewhat scanty—would be a valuable addition.

In paper No. 33, Messrs. Newman and Whelan describe an automatic picker developed by the N.C.B. on a pilot scale to separate "bright" from "hard" coal in order to replace hand picking. It has been tested on certain "ores" and calculated costs are low. The process is able to differentiate between diffused reflections and specular reflection so that even when the total reflected light is the same, different surfaces can be distinguished.

The estimated operating cost gives ranges from 0.15d. per ton of feed per 3 in. size to about 2.5d. for $\frac{1}{2}$ in. feed. This is an interesting possibility, particularly for material in the lower size range. Capital cost per ton is not given and this appears likely to be somewhat high.

Session 6. 11.35 a.m. Wednesday, September 24.

Paper No. 1.—*The relation of crystal lattice discontinuities to mineral dressing.* By Dr. A. J. E. Welch (Reader in Inorganic Chemistry at the Imperial College of Science and Technology).

Paper No. 21.—*The surface chemistry of flotation.* By Professor Nathaniel Arbiter (Associate Professor of Mineral Engineering, School of Mines, Columbia University, New York).

Paper No. 25.—*Flotation frothers, their action, composition, properties and structure.* By Dr. S. A. Wrobel (Research Manager, Mineral Recovery Ltd., London).

Paper No. 22.—*Selective flotation of metals and minerals.* By Dr. J. H. Schulman and Mr. T. D. Smith (Rhokana Unit, Department of Colloid Chemistry, Cambridge University).

Dr. Welch has produced a brief and most readable review showing how fundamental processes of mineral dressing may be influenced by characteristic properties of crystal lattices and in this connection deals with mosaic structures, crystal faces and edges, adhesion between crystal-line solids and active states in solids.

It is suggested that in some cases part of the effectiveness of wet grinding may be due to adsorbed water in the mosaic. This and other points, such as possible effects of

solid adhesion, could be subjects of interesting discussion.

Paper No. 21 reviews the present knowledge relating to the surface chemistry of minerals and its bearing on flotation.

Paper No. 25 is a comprehensive review of the published studies of froth and frothers, and the linear and lamellar film theories of attachment of mineral to bubble are discussed. There is a great deal of evidence to support the latter and the subject is one for some speculation.

Structures of frother molecules are also discussed and to sum up, a set of ideal characteristics are given and suggestions are made as to the molecular structure of desirable frothers.

In paper 22, the authors discuss how adsorption takes place, either in the form of monolayers or as multilayers. An investigation of the effect of *p.H.* on adsorption is described and it is shown that sparsely covered surfaces give the best flotation when chemisorption of the agent is involved whilst multilayer adsorption is better when chemical reaction takes place. Flotation is shown to be poor at a high reagent concentration which bears out practical experience.

It is demonstrated that only a small fraction of the surface need be covered with collector to induce flotation. This agrees with the findings of Gaudin and others who have used radio-active tracers as a means of determining the concentration of the collector.

Session 7. 2 p.m. Wednesday, September 24.

Paper No. 23.—*The process of bubble-mineral attachment.* By Mr. L. F. Evans and Mr. W. E. Ewers (Division of Industrial Chemistry, Commonwealth Scientific and Industrial Research Organization, Melbourne).

Paper No. 26.—*Radioactive isotopes in mineral dressing research, with particular reference to flotation.* By Mr. J. S. Carr (Mineral Dressing Group, Chemical Engineering Division, Atomic Energy Research Establishment, Harwell).

Paper No. 27.—*The application of electrochemical methods to flotation research.* By Mr. S. G. Salamy and Dr. J. C. Nixon (respectively Research Assistant and Senior Lecturer in Ore Dressing, Department of Mining, University of Melbourne, Australia).

Paper No. 23 consists of a discussion of the theory of the collision process in flotation and a description of experimental measurements made. A reason for the disparity between the induction period for contact as measured by captive bubbles and that in a flotation cell is suggested.

Paper No. 26 in a very interesting review, describes the preparation of radio-active isotopes and a list of those which can be used is given. This is a fairly new tool in the hands of the research worker but a great deal of useful work has already been done in connection with flotation, comminution and mechanical picking.

In paper 27, the authors discuss the electrochemical approach and describe how flotation reactions at a mercury surface have been studied with reference to the electrode potential curves. It is shown that the reactions at a mercury surface are no different from those in other systems and it is argued that if a metal xanthate formation follows mass-action relations, then a similar technique might be applied to any system.

Session 8. 3.35 p.m. Wednesday, September 24.

Paper No. 24.—*Effects of soluble sulphide in the flotation of secondary lead minerals.* By Dr. M. G. Fleming (Senior Lecturer in Mineral Dressing, Royal School of Mines).

Paper No. 28.—*Some aspects of the flotation of oxidized minerals.* By Mr. E. J. Pryor (Reader in Mineral Dressing, Royal School of Mines).

Paper No. 30.—*The flotation of oxidized zinc ores.* By Professor Maurice Rey (Ecole Nationale Supérieure des Mines de Paris), and M. Paul Raffinot.

Paper No. 24 is an account of research (based on a Ph.D. thesis) concerning the effect of sodium sulphide on cerussite, desclorizite and vanadinite. The author shows that contrary to the views of the U.S. Bureau of Mines and others, the effects of this reagent on the three minerals are not similar but very different. Small amounts depress vanadinite and desclorizite when the same concentration is beneficial to cerussite. Soluble salts effect sulphidization, chlorides in particular repressing the effect. It is also claimed that sulphide activation of cerussite for subsequent xanthate collection is best carried out by one "strong" rather than "stage" sulphidization. This is contrary to accepted practice and is likely to produce some discussion. It seems likely that one large addition would be difficult to control in plant practice.

Paper 28 discusses the state of oxidation, the effects of dissolved salts in mill water, the use of fatty acids and frothing, and froth texture.

The importance of removing deleterious soluble salts from the pulp is stressed and there is no doubt that this has not received as much attention as it should have done in many instances.

A great deal of stress is laid on the air-bell function and the type of froth. The question of dispensing fatty acid is dealt with and modified forms of fatty acids are mentioned (such as the P.F. reagent devised by the author).

Paper No. 30 is an account of the development of a process for oxidized zinc ores now operating on a commercial scale and based on the fact that primary amines and dithiocarbamates have a collecting effect if combined with a sulphidizing action and "proper conditioning reagents."

Soluble salts of the primary amines are favoured and results quoted show recoveries of 80 to 82 per cent in a 40 to 43 per cent zinc concentrate from a 10 to 13 per cent feed. Actual reagents or their consumptions are not stated and although the fact that this separation is now on a commercial scale is most interesting, much more data is necessary to form a complete picture.

Session 9. 10 a.m. Thursday, September 25.

Paper No. 34.—*Arsenic and antimony sulphide minerals in cyanidation.* By Mr. N. Hedley and Mr. N. Tabachnick (American Cyanamid Co., Stamford, Conn.).

Paper No. 35.—*Treatment of ore from the gold mines of Union Corporation, Ltd.: a summary of metallurgical practice.* By Dr. O. A. E. Jackson (Consulting Metallurgist, Union Corporation Ltd., Johannesburg).

Paper No. 34 discusses the decomposition of those minerals and the effect on cyanidation indicating that arsenopyrite has little effect at *p.H.* of 12. While realgar has an appreciable effect, orpiment likewise was found to be detrimental. It is suggested that the inhibiting effect of arsenic and antimony on gold dissolution is not due primarily to oxygen depletion nor to precipitation of gold but to some interaction at the gold surface.

In paper No. 35, Dr. Jackson has produced a very welcome summary on some Rand practice, as little has been published in recent years. The importance attached to "pebble" selection is interesting. The return to as high as 86 per cent of critical speed on pebble mills in order

to increase the capacity to capital cost ratio is worth comment but appears to be at variance with some evidence fairly recently published in the United States. ("Effects of Mill Speeds on grinding costs," by H. Hardinge and R. C. Fergusson, Trans. A.I.M.E. Vol. 187 Nov. 1950.)

Session 10. 11.35 a.m. Thursday, September 25.

Paper No. 15.—*The heavy-media plant at Stripa mine, Sweden.* By Mr. S. Dalhammar (Technical manager, Stållberg Group) and Mr. P. Hison Fahlstrom (Concentration Division, Boliden Mining Co.).

Paper No. 36.—*Recent developments in practice at the Sullivan concentrator.* By Mr. H. R. Banks (Superintendent of the Sullivan Concentrator, The Consolidated Mining and Smelting Co. of Canada, Ltd.).

Paper No. 40.—*Mineral dressing in diamond mining.* By Mr. C. Stent (Consulting Metallurgist, Anglo-American Corporation of South Africa, Ltd.) and Dr. R. S. Young (Director of Research, Diamond Research Laboratory, Johannesburg).

In paper No. 15, a description of a plant is given where it is very important to remove the fine magnetite from the feed as it dilutes the ferro-silicon medium. Methods tried to clean the contaminated medium are discussed, the solution found being to remove the magnetite which becomes ground very fine by the harder ferro-silicon using a hydrocyclone.

In paper No. 36, Mr. Banks describes recent modifications in the Sullivan plant including underground crushing, sink and float plant and the installation and operation of the giant high speed rod mill.

In paper No. 40, the authors point out that many unique features are found in diamond recovery, one being the low ratio of valuable constituents to waste.

The modern trend is shown to be the replacement of jigs and washers by heavy media plants followed by grease tables and/or electrostatic separation. Jigs are retained to treat -10 mesh material and at one plant electrically vibrated grease tables are giving good results. Some diamonds which do not adhere to the grease are treated by electrostatic separation, whilst a new process involving rendering the "refractory" diamonds water repellent has been developed, aliphatic amines, fatty acid soaps and certain marine oils being used as reagents. Experimental work on froth flotation is also being undertaken to recover very small diamonds.

Session 11. 2 p.m. Thursday, September 25.

Paper No. 29.—*The development of milling technique at the Boliden Mining Company.* By Professor P. G. Kihlstedt (formerly of the Boliden Mining Company, now Professor at the Royal Institution of Technology, Stockholm).

Paper No. 37.—*The Quemont milling operation.* By Mr. C. G. McLachlan, Mr. M. J. Bennett, and Mr. R. L. Coleman (respectively Metallurgical Consultant, Mill Superintendent, and Assistant Mill Superintendent, The Quemont Mining Corporation, Ltd., Noranda, Que.).

In paper No. 29, "Planned Ore Treatment" is described which consists of putting ore in batches and determining their characteristics before treatment. This is a very interesting idea and the control of the plant feed is not usually given. The considerations desirable are underground operations integrated with the metallurgy. Where this has been done, as at the Tennessee Copper Co., great benefit has resulted.

The importance of temperature control is shown and

although mention is made of improved fine grinding without excess "sliming," details are not given as to what and how the changes improved results. The question of recovering andalusite from wall rock is also interesting but little detail is given.

In paper No. 37, the interesting points in connection with the treatment of the gold-copper-zinc ore, are the use of aerators (now employed for some years in this district), the use of rod mills in closed circuit, and the flotation details, including the use of mechanical cells followed by pneumatic units of the MacIntosh type for roughing.

Session 12. 3.35 p.m. Thursday, September 25.

Paper No. 38.—*Design and construction of small concentrates in British Columbia.* By Mr. Harold M. Wright (President, Wright Engineers Ltd., Vancouver, B.C.).

Paper No. 39.—*The preparation and grading of chrysotile asbestos in Canada.* By Mr. G. F. Jenkins (General Manager, The Asbestos Corporation, Ltd.).

Paper No. 38 is a description of the design and flow sheets of several small flotation plants treating lead-zinc ores.

There are several interesting points of practical detail in the paper and a number of tables showing operating costs, and capital costs are given.

Paper No. 39 is a description of plant used in asbestos treatment with a historical sketch and includes some notes on the application of the "Aerofall" mill.

Underground Refrigeration

A major difficulty in mining in the Orange Free State is the fact that, for a given depth below surface, rock temperatures in the province's gold fields are considerably higher than temperatures on the Witwatersrand. The heat and humidity of Free State mines would render conditions trying and would probably materially reduce the output of underground workers, were it not possible to adopt counter measures. The temperature limit at which men are able to work is set by the humidity of the air, which is raised by the water used during development and mining operations.

A refrigeration plant which will make it possible for men to work in parts of the mines which otherwise would prove untenable is being designed by the Technical Development Section of Anglo-American Corporation of South Africa Ltd. An account of this plant appears in *Optima*, Vol. 2, No. 3, a quarterly review published by the Corporation.

Two types of refrigeration equipment are being designed by the Technical Development Section, which are intended for use in cooling the air supply immediately before it is delivered to a working place. The larger type is not intended as a permanent installation, and will be used in those parts of the mines such as stope faces, where work will be continued over long periods. The second type of equipment will be a small portable "spot cooler" which can be quickly moved to confined working places, such as development ends, or to areas where work is of a temporary nature.

Refrigeration has been applied in principle on some Witwatersrand mines for many years, the usual method being to instal refrigeration plant at the surface. Cold air is then passed down the shaft and through the workings, and in some deep mines of the field a supplementary refrigeration plant is set up underground at a central point. This serves as a distribution centre for air to the lower levels.

MACHINERY AND EQUIPMENT

Specifications for Safety Footwear

At a Press conference held recently in London, leading manufacturers of the footwear industry presented a comprehensive background as to the requirements desired by the B.S.I. in safety footwear worn in Britain's industrial plants. Safety footwear was defined as that footwear which has built-in external steel toe caps, and which is manufactured to comply with the B.S.I. Grade I or Grade II specification. This footwear is designed solely to reduce the number of foot accidents in industry.

The toe caps mentioned are of specially tempered steel, which are fitted internally or externally during manufacture. The number of firms which supply this material is very limited. While the caps weigh 2 oz. only, they nevertheless are designed to withstand a shock test of 150 ft.-lb., which is the equivalent of a 60 lb. weight dropped from 2½ ft. or a dead weight of 3 tons. The granting of a licence to use a B.S.I. mark includes a provision for regular testing of the toe cap by a device in which a 60 lb. weight is dropped 2½ ft. Eighteen months of design and manufacture were needed to produce effective dies, and in the case of miners' boots, the toe cap is worn externally to prevent friction of the leather in rough underground work.

The British Standards Institution requires that miners boots shall be riveted through the undersoles and outsoles and stitched to the heel, brass screwed aloft by screws spaced at not more than 1 in. distance. The minimum substance of the leather shall not be less than 2 mm. vamp, a quarter of not less than 1.75 mm., a cap of at least 1 mm. and a counter of at least 1 mm. Further, the leather must not contain less than 2 per cent chromium, based on degreased leather, and previously wetted leather shall not shrink in area less than 5 per cent on immersion for one

minute in water at a temperature of 90°C. Where a semi-chrome or vegetable tanned upper leather is used it shall be adequately curried and shall contain not less than 15 per cent of fat, calculated on the fat-free weight.

The outsoles must have 8-iron for hobs, 9-iron for cutlans, and 10-iron for plain bottoms, and the through soles shall be of bend a shoulder of minimum substance of iron. Insoles must be of solid leather, unbacked shoulder of minimum substance 6-iron, or of unbacked belly of minimum substance 7-iron. Grade I miners' boots must comply with the requirement of a drop test of 150 ft.-lb. and grade II with those of a drop test of 100 ft.-lb.

First Aid Equipment

The demands of first aid, both in knowledge of the subject and in the supplies necessary for its effective application, are internationally widespread and find use in every walk of modern life. Yet no sphere is more important than the mining industry, for here accidents occur under particularly dirty and unsterile conditions.

The first aid products of Cuxson, Gerrard & Co. Ltd. cover a wide field, from iodine ampoules to completely equipped ambulance rooms, and embrace the smallest of requirements in the form of dressings, plasters and tablets, to the larger pieces such as splints, stretchers and examination couches.

The company renders special attention to export items, and a first aid outfit designed for the tropics contains a snake-bite lancet. Ligatures and sutures are manufactured under Ministry of Health licence, all types of penicillin treatments are compounded in hygienic laboratories, and the company presents a range of surgical and medical plasters.

Rolling Stock for the Mining Industry

Pit rolling stock of all types is presented by John Ingham & Sons Ltd. The Ingham patent flat bottom tube has a solid flanged steel plate bottom, with radius corners and deep vertical flanges all the way round. The unit is equipped with integral buffers and assembly can be completed in the minimum of time. The firm's well-bottomed tubes are claimed to allow a 10 per cent to 15 per cent increase in coal capacity. By use of this model standard tare can be maintained and no interference occurs with existing creepers, tube stops, cages or other handling equipment. The design was evolved because conveyor loading wears away the base portion of a tube bottom at a greater rate than other parts of the tube.

In one colliery alone, 250 Ingham cars with aluminium alloy plate bodies mounted on steel chassis are in use. The substitution of aluminium alloy for steel as far as it is effected, to meet tare requirements, is claimed to reduce the weight of the components concerned by two-thirds. Drop Bottom Cars for any system of mining and for use with locomotive and rope haulage are also presented, the automatic opening device being operated from the sides or from underneath the cars.

Instrument to Detect Overheating Weakness in Metals

An inexpensive electronic instrument to test flaws in exhaust systems and similar installations, measures only 2 in. by 3 in. by 4½ in., and is rated at 5 W operating on 115 v. A.C. is announced in *American Aviation*. Developed by the American Instrument Co., this instrument differs from other known testing devices in that it determines specifically the extent to which a part has been weakened from being overheated, and will not detect mechanical failures that are not caused from excessive heat. The latter, of course, can be detected by visual inspection.

The device is, in effect, a sensitive instrument for measuring the permeability of stainless steel and Inconel commonly used in exhaust system components. When placed on a component that is in good condition, a nil reading is obtained. A small probe is moved across the surface to be examined, but if the surface has been subjected to excessive heat the needle will swing to a high reading. The instrument thus detects conditions which can not be detected visually, and in addition is capable of differentiating between simple surface corrosion and penetration that will affect the life of the unit. The instrument can be visualized as doing useful work within the mining industry.



Mr. George Denton, Chairman of the B.S.I. Committee on Safety Footwear, demonstrates the strength of safety footwear

METALS, MINERALS AND ALLOYS

The immediate threat of a coal stoppage in the U.S. at the end of this month has been averted by an interim agreement reached this week between the United Mine Workers and the anthracite producers. Pending the negotiation of a new contract, the coal owners have undertaken to increase their contribution to the United Mine Workers Welfare Fund from 30c. to 50c. per ton. The situation in the soft coal mines remains unchanged with the possibility of strike action at the end of the month. Faced with this situation the U.S. Government plans to issue an order freezing shipments from many soft coal mines and providing emergency stockpiles.

U.S. non-ferrous metal prices have on the whole been firm this week with the copper market particularly active. Further control of relaxations have been announced in the past week from Washington and Ottawa. Washington has ended the domestic allocation of tungsten and molybdenum owing to the improved supply position. Restrictions on use, however, remain unchanged. The Canadian Government has freed semi-fabricated copper and aluminium from control and it is thought in some quarters that this step may be preliminary to a complete decontrol in Canada of all essential metals.

COPPER.—The U.S. Office of Price Stabilization has granted an increase in the price of domestically produced copper to Calumet & Hecla Consolidated Copper. The company appealed for an increase on the grounds that increased costs had been incurred and that these increases were greater than the price increase received. The new price allowed is 27.50c. per lb., against 24.62½c. per lb. Calumet produces only a very small proportion—roughly 2 per cent of the U.S. copper output, but the concession might lead other producers to send in claims. It certainly further complicates the multi-price structures. The company itself is reported to have tried to play down the increase by saying that the higher price would make sales more difficult when competing with firms still operating under the old price ceiling.

Trade circles in New York say that the allocations of foreign copper have exceeded the actual amount offered for sale. Already sellers of foreign copper are reported to have closed their books for September while demands for October plus unfilled September allocations exceed prospective supply. The position would have been much worse if G.S.A. had not refused to buy its allocation, because it consisted solely of the dearer foreign copper. There have been suggestions that the November allocation will include some domestic copper at least.

As there has been no recent change in the American price of copper, no alterations have been made in the price agreed between the Ministry of Materials and the Commonwealth copper producers and the present agreement remains in force indefinitely.

LEAD.—Although it has been generally understood that the Ministry of Materials would not unload stocks of lead hurriedly when the lead market re-opens on October 1, the Ministry has felt compelled to issue an official statement on the subject. The policy will be to release not more than a relatively small tonnage during the early months of the new arrangements. The Ministry claims that it is satisfied that this tonnage will be adequate to meet the requirements of consumers and the Ministry has reserved the right to suspend selling when it is satisfied that sufficient lead is available from private sources to satisfy demand.

The U.S. price remains at 16c.

TIN.—When the U.S. Government ceased being the sole buyer of tin the Office of Price Stabilization made it clear that the re-sale of tin would be subject to the existing import regulations regarding price mark-up. The O.P.S. recognizes that while these regulations can apply to a large number of imports, they raise several practical difficulties when applied to tin. The O.P.S. has, therefore, decided that where the price of tin being re-sold does not exceed \$1.21½ per lb., metal content, f.o.b., New York the import regulations will not apply but if the price should exceed that amount the regulations will come into force. The price of \$1.21½ is, of course, the current selling price of the R.F.C., and tends now to be in effect the U.S. ceiling price.

The Bolivian Government seems set on nationalizing the tin mines, but the reasons given differ from time to time. At the

beginning of the month, the President of Bolivia said that the mines would be nationalized because the nation needed their riches. At Mexico City last week the Bolivian Governor of the World Bank emphasised the economic power of the big mine owners alleging that they had become stronger than the State. This, he claimed, had led to the permanent flight of capital; and Patino, Hochschild and Aramayo interests dominated the social, legal, political and economic life of the country. This attack on the tin interests ended with an appeal to the World Bank and I.M.F. to send experts to Bolivia to study economic needs and possibilities.

No further progress has been reported between the Mercantile Metal and Ore Corporation and the R.F.C. The former's option to act as Bolivia's sales representative was due to expire last Wednesday.

ZINC.—The market importance of the U.S. stockpile has again been demonstrated this week. The zinc price went firmer largely because the G.S.A. asked producers how much prime-western they expect to offer to the national stockpile up to the end of September, 1953. They have also been asked what price they expect to receive and whether the zinc will be domestic or foreign. Lead producers were also asked much the same questions about deliveries to the stockpile. No indication was given by the G.S.A. of its intentions towards stockpiling.

Following this week's advance in the East St. Louis price of Prime Western zinc from 14.00c. per lb. to 14.50c., the British price rose by £4 per ton to £122 for good ordinary brand zinc delivered. Although the belief was held that 14c. was a bottom price, the increase caught the trade by surprise and there have been forecasts that the price will revert to its former level in the next few days. Certainly, there is no shortage of zinc for the stocks accumulated in the U.S. as a result of the steel strike stand at around 96,000 tons.

As we go to press it is learned that the East St. Louis price of Prime Western zinc has been reduced to 14c. per lb. This price decline, initiated by the American Metal Co., caught the U.S. domestic market by surprise.

NICKEL.—The Nicaro mine, situated 450 miles from Havana, which closed down in 1947, and was reopened again last year under the pressure of nickel shortage, is now reported to be in full production. A target of 15,000 tons of nickel a year has been set. In Washington Mr. Jess Larson is reported as saying that the non-Communist world is now assured of a supply of nickel at least 10 per cent larger than when the Korean war began. A Cuban company, the Fomento Minerales Cubanos owns the mine jointly with the U.S. Government which holds a 60 per cent interest. The National Lead Co. operates the mine.

NIOBIUM.—The director of the Norsk Bergwerk A/S, the Norwegian Government owned mining company, has announced that a satisfactory method has been developed of processing the niobium ore discovered in Telemark. A pilot-plant is under construction and extraction will initially be at the rate of 40,000 tons of ore per year yielding 150 tons of concentrates with a 50 per cent metal content.

QUICKSILVER.—The U.S. domestic price rose slightly on Wednesday and is now quoted at \$188-191 per flask against \$186-188 previously. The London price however remains unchanged.

The Indian Government is reported to have under consideration allowing the re-export of quicksilver. Indian stocks are currently put at 23,000 flasks against an annual consumption of around 5,000 flasks.

URANIUM.—The reluctance of Mount Isa Mines to undertake the task of developing the uranium deposits at Rum Jungle, in the Northern Territory of Australia, has apparently led to an offer being made to Consolidated Zinc Proprietary, a wholly-owned subsidiary of Consolidated Zinc Corporation. The company will be paid a management fee, according to a report from Canberra, and the Government will provide the necessary capital itself. The uranium ore will be refined to uranium oxide, 308, but the location of the refinery is not given.

Mr. J. H. Viljoen, South African Minister of Mines, has again repeated his prophecy that when South Africa's uranium contracts

are fully developed, they will mean as much for the country as its gold production. This is apparently being taken in South Africa to mean that uranium production will double the sales output of the gold mine which is now running at some £150,000,000 a year. If this is the correct interpretation of the Minister's remarks, there is clearly a big new industry in the making, which is going to add its own demands to the existing urgent claims on the supply of labour and materials.

It is reported that South Africa is planning to spend £50,000,000 on extracting uranium from the Rand gold mine dumps, and that production will start in October. According to Mr. Paul Sauer, Minister of Transport, the Rand dumps contain more uranium than any other deposits in the world.

The London Metal Market

(From Our Metal Exchange Correspondent)

The London tin market, after showing some weakness in the latter part of last week, which was not reflected in the East, has again assumed a firmer appearance, and prices have recovered to approximately those ruling in the early part of last week. Stocks of tin on warrant have increased moderately, and this should tend to prevent any violent widening of the backwardation. In the East demand has been well maintained, and daily offerings there have been readily absorbed at, generally speaking, rising prices. There is still a persistent demand for Straits tin afloat and for early shipment to the Continent, mostly destined for New York in connection with cheap sterling transactions. This business has no doubt been helped by the reduction in the freight quotations from the Continent to New York owing to the depressed state of the freight market.

The copper market in America remains firm on a basis of the Chilean export quotation, and European prices have risen to approximately the same parity. Demand is good for the fourth quarter, but doubts are expressed as to whether the price will be maintained after the end of the year.

An unexpected advance of ½c. per lb. has taken place in the zinc price in the States, but it is by no means certain that buyers will come in on the firmer market: in Europe the market is idle with quotations slightly above £100 per ton for g.o.b., and £110 per ton for refined, both ex works.

The lead market is featureless, with the Mexican export quotation showing a slight downward trend and the European price remaining steady at around £115 per ton ex works.

On Thursday the official close on the tin market was: Settlement price £961, Cash Buyers £960 10s, Sellers £961; Three months Buyers £951, Sellers £953. In the afternoon the market was steady. Turnover for the day was 150 tons. Approximate turnover for the week was 640 tons.

The Eastern price on Thursday morning was equivalent to £985 15s. per ton, c.i.f. Europe.

Iron and Steel

An important change in the iron and steel trade comes into operation to-day. The Board of Trade announces the suspension of the import duties on a wide range of iron and steel goods for a period of one year. In the main these goods are centrally purchased by the British Iron and Steel Corporation under an arrangement with the Ministry of Supply, but the effect of the new order is that all imports of these goods, whether centrally or privately purchased will be free of import duties, and the administrative arrangements will be simplified. It is explained that the Order makes no change in the import licensing position, and the net effect on the purchases by the Corporation is also unchanged as it has been the established practice to refund the customs duty on these goods.

Production of iron and steel in the U.K. continues to expand. In four successive months steel production has exceeded that for the corresponding period of last year and the August output of pig iron was the highest ever. Nevertheless the demand for supplies is so extensive that imports on a large scale are still necessary and even bigger tonnages have been purchased for delivery in the next three months.

The expansion of pig iron production has given a big impetus to the steel industry, but the dearth of scrap is still a limiting factor. The shrinkage in the supplies of foreign scrap has been catastrophic and sellers abroad have taken full advantage of the prevailing scarcity. Thus the average price paid for foreign scrap is now approximately double what it was a year ago, and nearly four times the fixed price of home bought scrap.

On the other hand U.K. steel prices remain well below world levels, and in fact the margin in favour of British steel has widened in recent months owing to increases in the price of American and German products. A comparative table prepared by the British Iron and Steel Federation shows that for many steel products the margin in our favour is over 30 per cent, from which it would appear that the hopes of a successful export drive are firmly based. Overseas demand for sheets, plates and tubes is very substantial but home requirements cannot be neglected and moderate increases in the allocation of steel for various home industries have already been sanctioned. More satisfactory deliveries of pig iron are now reaching the foundries and further expansion may be possible since two new blast furnaces are due to come into production very shortly.

REFINED COPPER PRODUCTION AND STOCKS—AUGUST

(000 s.tons)

	Production			Stocks		
	August, 1952	Jan.-Aug., 1952	Jan.-Aug., 1951	Aug. 31, 1952	July 31, 1952	Aug. 31, 1951
U.S.A.	95	770	643	84	74	71
Other countries	99	821*	910	167	180	161
World.....	194	1,591*	1,553	251	254	232

Source: American Copper Institute. * Includes a revised figure for July, 1952

SEPTEMBER 18 PRICES

COPPER

Electrolytic £285 0 0 d/d

TIN

(See our London Metal Exchange report for Thursday's prices)

LEAD

Soft foreign, duty paid £131 0 0 d/d

Soft empire £131 0 0 d/d

English lead £132 10 0 nom.

ZINC

G.O.B. spelter, foreign, duty paid £126 0 0 d/d

G.O.B. spelter, domestic... .. £126 0 0 d/d

Electrolytic and refined zinc £130 0 0 d/d

Special high grade £132 0 0 d/d

ANTIMONY

English (99%) delivered, 10 cwt. and over £225 per ton

Crude (70%) £210 per ton

Ore (60% basis) 22s. 6d./27s. 6d. nom. per unit, c.i.f.

NICKEL

99.5% (home trade) £454 per ton

OTHER METALS

Aluminium, £157 per ton.	Osmiridium, £35 oz. nom.
Bismuth, 18s. lb.	Osmium, £70 oz. nom.
(min. 2 cwt. ex-warehouse).	Palladium, £8 10s. oz.
Cadmium, (Empire) 14s. 4d. lb.	Platinum, £27/£33 5s. nom.
Chromium, 6s. 6d. lb.	Rhodium, £45 oz.
Cobalt, 20s. lb.	Ruthenium, £30 oz.
Gold, 248s. f.o.z.	Quicksilver, £64 10s.
Iridium, £65 oz. nom.	ex-warehouse
Magnesium, 2s. 10½d. lb.	Selenium, 25s. nom. per lb.
Manganese Metal (96%-98%)	Silver 73d. f.o.z. spot and f'd.
2s. 2d./2s. 3d. per lb. d/d	Tellurium, 18s./19s. lb.

ORES, ALLOYS, ETC.

Bismuth	40% 7s. lb. c.i.f.
	30% 5s. 9d. lb. c.i.f.
Chrome Ore—	
Rhodesian Metallurgical (lumpy)	£14 2s. per ton c.i.f.
" " (concentrates)	£14 2s. per ton c.i.f.
" " Refractory	£15 8s. per ton c.i.f.
Baluchistan Metallurgical	£15 8s. per ton c.i.f.
Magnetite, ground calcined	£26 - £27 d/d
Magnetite, Raw	£10 - £11 d/d
Molybdenite (85% basis)	105s. 10d. per unit c.i.f.
Wolfram (65%)	425s. c.i.f. U.K. buying
" " " " " "	447s. 6d. d/d U.K. selling
Tungsten Metal Powder (for steel manufacture)	31s. 7d. nom. per lb. (home)
Ferro-tungsten	28s. 7d. nom. per lb. (home)
Carbide, 4-cwt. lots	£32 3s. 9d. d/d per ton
Ferro-manganese, home	£49 0s. 8d. per ton
Manganese Ore U.K. (48% - 50%)	6s. per unit
Brass Wire	2s. 9d. per lb. basis.
Brass Tubes, solid drawn	2s. 3½d. per lb. basis.

COMPANY NEWS AND VIEWS

Beral Tin's Future Assured

To those who have been following the fortunes of Beral Tin and Wolfram, the excellent results published in a preliminary statement covering the year ended March 31 last were not unexpected. Since October, 1951, the company has maintained its wolfram output at over the 200 ton per month mark and although the price of wolfram has fallen from its former peak its average over the year under review was roughly 500s. per unit. This is good money by any reckoning and with long term contracts negotiated with the U.K. and with the U.S.A. Governments in October and June, 1951 respectively, for the supply of wolfram at a fixed price, the company was able to concentrate on keeping production up and costs down rather than having to worry about the general state of the wolfram market.

In the event, as the table below clearly shows, output averaged close on 200 tons per month throughout the year, with the result that profits before tax advanced sharply. The tax attracted was appreciably heavier but even so the company, without strain, was easily able to double its total dividend distribution, allocate £50,000 (same) to a pension fund, transfer the substantial sum of £400,000 (nil) to general reserve, leaving a balance of £178,509 to be carried forward.

Year to Mar.31	Production WO ₃ Tin (tons conc.)	Working £	Tax £	Net Profit £	Divi- dend %	Carry Forward £
1952	2,388	88	2,174,969	1,336,570	838,399	200
1951	1,760	139	892,294	534,251	358,043	100
						178,509
						137,660

In addition to the two contracts for the supply of wolfram referred to above, the preliminary statement announces a further fixed price contract with the U.S.A. for the supply of approximately 2,500 ltons of wolfram concentrates over the next five years from October 1 next.

On present assumptions therefore, the hitherto speculative element which was associated with the shares of Beral Tin and Wolfram, dependent as they were on the fluctuations in the wolfram price, has been practically eliminated. Thus there appears no *prima facie* reason why the current year's results should not be as good as those during the year under review. Certainly the monthly returns for the first five months of the current year, which show that 936 tons of wolfram and 58 tons of tin were produced compared with 927 tons of wolfram and 21 tons of tin in the same period of the year under review, give every encouragement that all commitments will be met.

Mr. F. Gates is chairman. The company's one class issued capital is £331,000 in shares of 5s.

Records Broken at Indian Copper

Operations at Indian Copper Corporation during 1951 were on a larger scale than for some years past. The tonnage throughput was the highest since 1941 and was only 2,267 s.tons below the all-time record attained in 1940. This improvement together with the better grade of ore treated were responsible for the increase in the refined copper output which was the best achieved since 1936 and also reflects good percentage metallurgical recovery per ton.

Year to Dec. 31	Copper Treated (s.tons)	Ore Con- cent. tent %	Copper Output (s.tons)	Refined (ltons)	Copper* Sales £	Kyanite† Sales £
1951	395,123	2.15	33,358	7,083	2,196,387	41,518
1950	386,156	2.08	32,150	6,614	1,828,910	90,516

*Net proceeds from sales and increase of stocks on hand during the year.

†Profit on sales of Kyanite.

On the other hand, owing to general market conditions, transport restrictions and the high cost of zinc, the brass foundry and rolling mill contributed less than in the previous year, the output of rolled metal being 6,907 ltons against 8,058 ltons. This decline did not, however, noticeably affect the financial results nor did the contraction by over 50 per cent of the amount of kyanite exported. Costs were higher but not seriously so and, in any event, a proportion of these were usefully incurred in plant alterations and in large scale test work carried out in connection with by-products.

The net profit figure showed up well against the preceding year's earnings and the distribution of 12½ per cent, tax free, compares with 12½ per cent, less tax, in 1950. This required £114,275 against £59,994. Moreover, the carry forward figure shown in the above table was arrived at after allocating £100,000 (£85,000) for depreciation and £175,000 (£30,000) to general reserve bringing that account up to £810,000 or not far short of the issued capital of £914,200 in shares of 2s. each.

Year to Dec. 31	Gross Revenue £	Mining Expenses £	Tax £	Net Profit £	Divi- dend %	Carry Forward £
1951	2,257,116	1,310,656	455,000	434,712	12½*	85,540
1950	1,925,532	1,264,838	347,000	265,682	12½	40,103

*Free of tax.

The transfer of the company's seat of control and management from this country to India was effected on April 6, 1952, so that the foregoing results will be the last directly and wholly attributable to the former U.K. management. With the outlook for copper continuing bright and no U.K. taxes to pay on the current year's results, the company should do as well as, or better than, the year under review.

The annual meeting will be held in Calcutta on October 8. Mr. K. R. Fettes is chairman.

Clutha River Pays 6 Per Cent

Clutha River Gold Dredging, the New Zealand gold producer, enjoyed a very successful year during the twelve months ended March 31, last. Indeed, in every respect the company was able to record an improvement over the preceding year's results.

Year to Mar. 31	Ground Dredged (cu. yd.)	Per Cubic Yard Value (pence)	Cost (pence)	Yield (oz.)	Gold Proceeds £
1952	2,679,000	7.05	3.32	6,736	78,716
1951	2,417,000	3.72	5.16	3,222	37,454

The results presented in the tables accompanying this note speak for themselves and call for little comment, although with regard to costs it will be recalled that during the previous year these were adversely affected by the dredge having to cross the river.

Year to Mar. 31	Gross Revenue £	Spent in N.Z. £	Tax £	Net Profit £	Divi- dend %	Carry Forward £
1952	80,072	37,024	14,162	18,436	6	7,505
1951	58,192	52,014	547	Dr. 19,821	Nil	1,053

All signs point to another prosperous year ahead. During the period April 1 to September 5, gold production totalled 2,543 oz. compared with 2,756 oz. during the year under review. While this shows a slight reduction, it is to be remembered that since August 14 last, the New Zealand Government granted gold producers the right to sell the whole of their output on the free market. At present the free market has shown considerable resistance to a level below \$1.40/\$1.50 premium per f.oz. which, if maintained, should materially assist in offsetting the results of any small production decline.

The annual meeting will be held on October 8. Col. Charles Edward Ponsonby is chairman.

Water Trouble at No. 2 Shaft of F.S. Geduld

Free State Geduld Mines has announced that on the night of Sunday, September 7, an inrush of water occurred at the 5,350 ft. level of the company's No. 2 shaft. Additional pumps, the announcement states, were installed and by Tuesday the inflow of water was under control. In the early morning of Friday, however, a further inrush occurred which proved more than could be dealt with by the augmented pumping capacity and by baling. Before steps can be taken to seal off the inflow it is necessary either to allow the water to find its own level or to introduce a concrete plug in the shaft. The former method is being adopted as being likely to cause less delay.

It is not possible yet to give an estimate of when it will be possible to resume shaft sinking operations.

CONSOLIDATED TIN SMELTERS LTD.

The Twenty-third Annual General Meeting of Consolidated Tin Smelters Ltd. was held in London on September 11, the Chairman, **Mr. Ernest V. Pearce, A.M.I.M.M.**, presiding. The following is an extract from his circulated statement:

The net revenue of the parent company, after writing off an amount of £25,349 for constructional work, etc., is £286,626, compared with £309,125 for the year to March 31, 1951.

Your Directors have decided to recommend for approval a dividend of 2s. 6d., less income tax, on the Ordinary Stock.

The Group Profit after tax is £446,972, compared with £479,909 in the previous year.

The burden of taxation will be evident from the figures, which show that from a net profit of £1,311,492 Income Tax, Profits Tax and Excess Profits Levy take no less than £847,873.

The imposition of Excess Profits Levy is a further burden with which industry is faced in this country. It can in general only result in destroying incentive at a time when enterprise, initiative and maximum production are of vital importance to the country.

World production of tin in concentrates for the calendar year 1951, as disclosed by the Statistical Bulletin of the International Tin Study Group, totalled 164,500 tons, compared with 166,500 tons in 1950.

While the United States of America refrained from purchasing tin on the Singapore market during the period under review, it is pleasing to record the arrangement for mutual assistance in the supply of steel, aluminium and tin which was made between the Prime Minister and President Truman when Mr. Churchill visited Washington in January, 1952.

I think it can be fairly stated that this arrangement has been beneficial, not only to the United States of America and the United Kingdom in supplying them with the commodities of which they were in great need, but also to the tin producers of the world in establishing what was in effect a guaranteed floor price during some part of the term of the agreement.

At the time this statement is being written there is as yet no indication of when normal trading in tin in the United States of America is likely to be resumed. Various statements have been made, mainly in the technical press, to the effect that dealings in tin by the New York importers may be resumed in August, but other reports tend to place the date later in the year; both producers and consumers are eagerly anticipating the resumption of normal trading and freedom from control of end-uses. I am glad to say that some of these controls have recently been lifted.

In November, 1951, at the invitation of the Malayan producers, the United States Government sent a representative mission to Malaya for the purpose of studying the conditions regarding the production and marketing of tin. Members of the mission visited Penang and took the opportunity of going round the works of Eastern Smelting Co. Ltd. while there. They also had full opportunity of ascertaining the method of marketing tin in Singapore.

The emergency in Malaya has now entered upon its fifth year, and the miners and planters, to whom I have paid and still pay the highest tribute, continue at their work despite the strain and anxiety to which they have been for so long subjected. Recent reports from Malaya are much more encouraging than we have had for some considerable time.

In January of this year General Sir Gerald Templer was appointed as High Commissioner, and he has rigorously applied himself to the task before him. There are already indications that under his administration there is a greater measure of co-operation on the part of the peoples of Malaya than heretofore in the war with the terrorists. Once that co-operation is complete the end of the war will be in sight. Until that is achieved normal prospecting operations cannot be resumed, with the result that new areas can neither be proven nor equipped to take the place of those mines which in the next few years must approach exhaustion. When it is borne in mind that virtually no prospecting has been carried out for almost twenty years, it is apparent that, until normal prospecting can be resumed, production in Malaya must show a gradual decline. On the other hand, there are, I think, indications that, on the long term view, consumption will gradually increase, and it is on these two factors that I mainly base my opinion that we can look forward to a reasonable price for tin for some time to come.

The report and accounts were adopted.

KINTA KELLAS TIN DREDGING

MR. P. J. BURGESS' STATEMENT

The Twenty-fifth Annual General Meeting of Kinta Kellas Tin Dredging Co. Ltd. was held at Adelaide House, London Bridge, E.C.4, on September 12.

The following is an extract from the Statement by the Chairman, **Mr. P. J. Burgess**, which was circulated with the report and accounts for the year ended March 31, 1952:

Judged by the standards of 25 years ago, when our Company was formed, the financial results of the past year's working are very satisfactory with a primary profit of £45,624 on our issued Capital of £105,000. That standard to-day is out of date. Our Capital in 1926 was sufficient to equip our area with dredge and accessories but to-day it would require four times that capital to make a start. The practical importance of this is realized when the replacement of obsolete equipment has to be faced and provision for financing the exaggerated costs becomes a problem of first importance. A policy of "make do and mend" pushed to the limit must be adopted.

It is important as well as interesting to trace the fate of the £45,600 profit earned this year from mine operations. It may be thought of as divided into four nearly equal parts. The first two quarters go to once for taxes, Income Tax and Profits Tax, a quarter is appropriated to dividends, and the remaining quarter is used for additional dredge renewals and repairs required for keeping the dredge in really good condition considering its age, then some contribution is set aside to cover the depreciated value of the dredged land, and anything left over goes to a newly constituted contingencies reserve for eventual replacement of the dredge, or any other contingency. It is I think clear that taxation has pressed so severely upon our business of dredging for tin ore in Malaya that reserves for replacements have not been able to keep up with the increase of the costs in carrying out replacements contemplated.

THE BALANCE SHEET

In our Balance Sheet there are two features I should like to emphasize. Under the "Fixed Assets" you will note that our very modest first cost of the dredge of £67,590 has now been depreciated down to £6,187 and probably by next year it will have been written down to a nominal figure or perhaps zero. It is obvious that it still represents a considerable asset and there is a lot of life yet left in it. It is rather like the tale of the cricket bat which never wore out according to its proud possessor, though it had had three new handles and two new blades. The other feature of the balance sheet is its strength as shown by the excess of current assets over current liabilities, and if the investments be added to the current assets the excess is more than our issued capital.

The administration of the dredge and mine in Malaya since the recovery of it from the Japanese has been a matter of considerable anxiety to the Board of the Company and it has been found advisable to be associated with a group of other units without in any way affecting the independence of the Company. This has been done by the appointment of Messrs. Osborne & Chappel of Ipoh as General Managers for the Company in Malaya and it is believed that the Company will benefit very much from the expert supervision that the appointment gives us and the interchangeability of staff between all the units for which the firm are General Managers.

The price of tin fell from the record high peak of £1,610 per ton in April, 1951, to half this figure in August, four months later. The fall was as rapid as had been the rise. There was some recovery subsequently and it appears now to be fairly stable at about £950 per ton which allows a fair working profit on medium grade ground, but as I have said before the margin available for new development is woefully inadequate. The price of tin like the price of rubber is determined by political considerations under present day conditions of Governmental control of international trading and controls of both production and consumption, especially in the U.S.A. Quite contrary to general expectations this control has not led to stability in prices and I think that the root of the trouble is the absence of any long term linkage of the industries with the individuals who as officials make the final decisions which give rise to the violent up and down movements of raw commodity prices.

The guerrilla warfare, misnamed an "Emergency," has continued unabated in Malaya throughout the year. There is ground for hope that conditions are improving and that forces of law and order, now much increased, and vigorously employed, are getting the upper hand.

We have to thank our representatives in Malaya for looking after our interests during the past year, and our Staff for producing results while keeping the dredge running in spite of conditions of frustration, and restriction on enjoyment of off time and leisure, on account of emergency controls. It is hoped that more peaceful conditions will have arrived at the end of the current year.

The report and accounts were adopted.

SOUTH BUKERU AREAS

The Twenty-Third Annual General Meeting of South Bukeru Areas Ltd., was held on September 17 in London, Mr. Herbert T. Skipp (the chairman) presiding.

In the course of his review for the year ended December 31, 1951 (circulated with the report), the Chairman stated that the general manager had advised that the ground covered by company-operated paddocks was of much lower value than in previous years, and that production amounted to 57½ tons of tin ore and some 4 tons of columbite.

Nigerian expenditure again showed appreciable increases which primarily reflected the incidence, over the first full year of their operation, of the 1950 increases in wages and tin ore royalties reported in his previous review. The year's tin ore production had, however, realized a higher average price than for the previous year and, after crediting £3,605 in respect of columbite, the profit for the year amounted to £8,663.

Expenditure on prospecting of new areas and on labour camps had been written off and £5,600 provided in respect of estimated taxation on the profit for the year, and from the balance remaining the directors recommended a final dividend of 7 per cent, less tax, making a total for the year of 12½ per cent, less tax. The directors had also declared an interim dividend for 1952 of 3 per cent, less tax.

With regard to the company's properties, the Chairman recalled that the two overriding features over a considerable period had been the respective extent that tin ore production had been contingent upon the location and working of scattered deposits contained in the remnants of the workings of earlier years, and had progressively exceeded the tonnage of earlier estimated reserves. Arising thereon the general manager had advised that an unusually high proportion of partially worked ground was encountered during the year in company-operated paddocks, resulting in the much lower values above mentioned. He had also reported the continuance of similar results over the early months of 1952, and that while from past experience it seemed unlikely that no further ground suitable for company operations existed, the working of paddocks by company labour had in the meantime been substituted by extension of working by tin contractors and tributers.

The general manager had further advised that as a result of the prospecting operations of the year, 40 tons were added to tin ore reserves, from which 45 tons of the year's production had been produced, and that the reserves estimate at December 31, 1951, was accordingly 142 tons compared with 147 tons at December 31, 1950.

The report and accounts were adopted.

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NIGERIAN ELECTRICITY SUPPLY CORPORATION

INCREASED REVENUE

The Twenty-Third Annual General Meeting of the Nigerian Electricity Supply Corporation Ltd., was held at 66 Queen Street, London, E.C.4, on Tuesday last.

Mr. George Hemmatt, C.M.G. (Chairman) presided.

The following is the Chairman's Review for the year ended February 29 last:

Before proceeding to review the work and results of the year, I wish to refer with deep regret to the death on July 16 last of Mr. William Shearer, the Chairman of Messrs. Balfour, Beatty & Co. Ltd., our Technical Advisers and Agents. Mr. Shearer took a very kindly interest in this Corporation from its inception, and we owe much to his wise advice and great experience.

The Directors' Report and the Accounts for the year to the end of February, 1952, show the effect of a high demand for electric power. The number of units sold was the highest in our peace-time history, though it was twice exceeded during the war. The maximum demand rose from 11,300 kw. to 12,450 kw. and 54,830,619 units were sold compared with 46,083,181 units in the previous year.

The revenue from the sale of power rose from £207,923 to £231,959, and in both years some revenue was lost owing to the necessity to restrict the consumption of power in April at the end of the dry season. In the course of the year under review the work of raising the height of the Tenti Dam was completed. The additional volume of water thus impounded proved to be sufficient in the current year to provide power throughout the dry season without restriction of consumption. The completion of the second Jekko power station in 1953 should effect a very material improvement in 1954 and subsequent years.

Operational costs continued to rise, and the increase of £24,000 in the revenue from power sales was rather more than absorbed by increased costs and higher taxation. In the latter part of 1951 it became evident that it would be necessary to raise the rates charged for power when the agreements with consumers expired at the end of August, 1952, and arrangements with that object are now being made. The present power rates are only 20 per cent higher than the rates in force in 1934.

Turning to the Balance Sheet, it will be seen that the Authorized Capital has been increased to £600,000, and the Issued Capital to £594,545. Shares representing the addition to the Issued Capital were offered to existing shareholders at par.

Fixed Assets have risen by £25,038 to £1,206,282. The increase in this item would have been greater if construction at Jekko had not been held up by unavoidable delay in the supply of the heavy plant for the power station. This difficulty has been overcome and good progress has been made since the beginning of the current year.

The satisfactory results in the year under review could not have been obtained without the loyal and efficient services of our Manager, Mr. H. P. Brace, and his European and African Staff in Nigeria, and our thanks are due to them and to our Secretary and his staff in London.

We have also to thank our Consulting Engineers, Messrs. Mackness & Shipley, and our Technical Advisers and Agents, Messrs. Balfour, Beatty & Co. Ltd., for their services in London.

The report and accounts were adopted.

W. E. SINCLAIR, M.I.M.M.

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SITUATIONS VACANT ADVERTISED.—The Notification of Vacancies Order, 1952, must be complied with where applicable.

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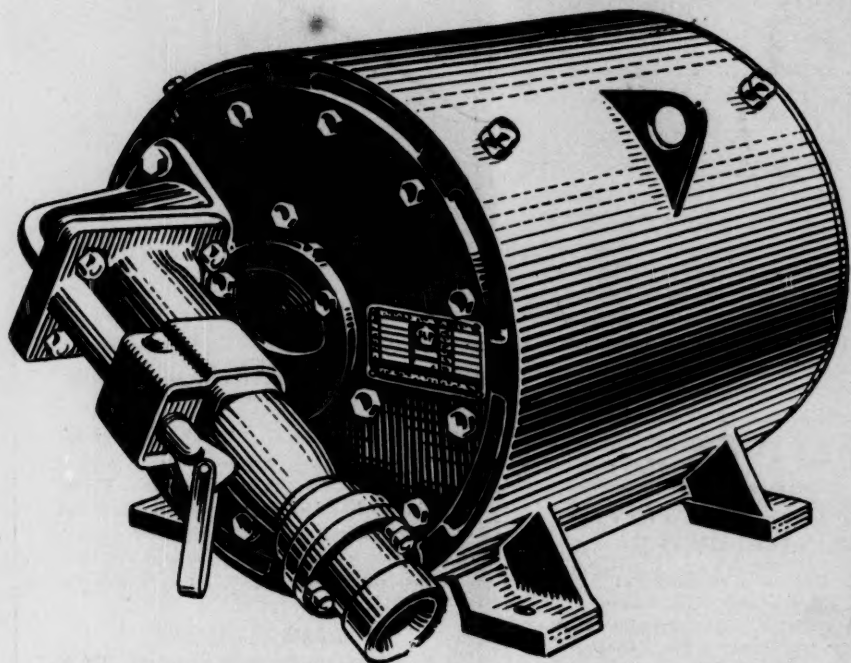
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